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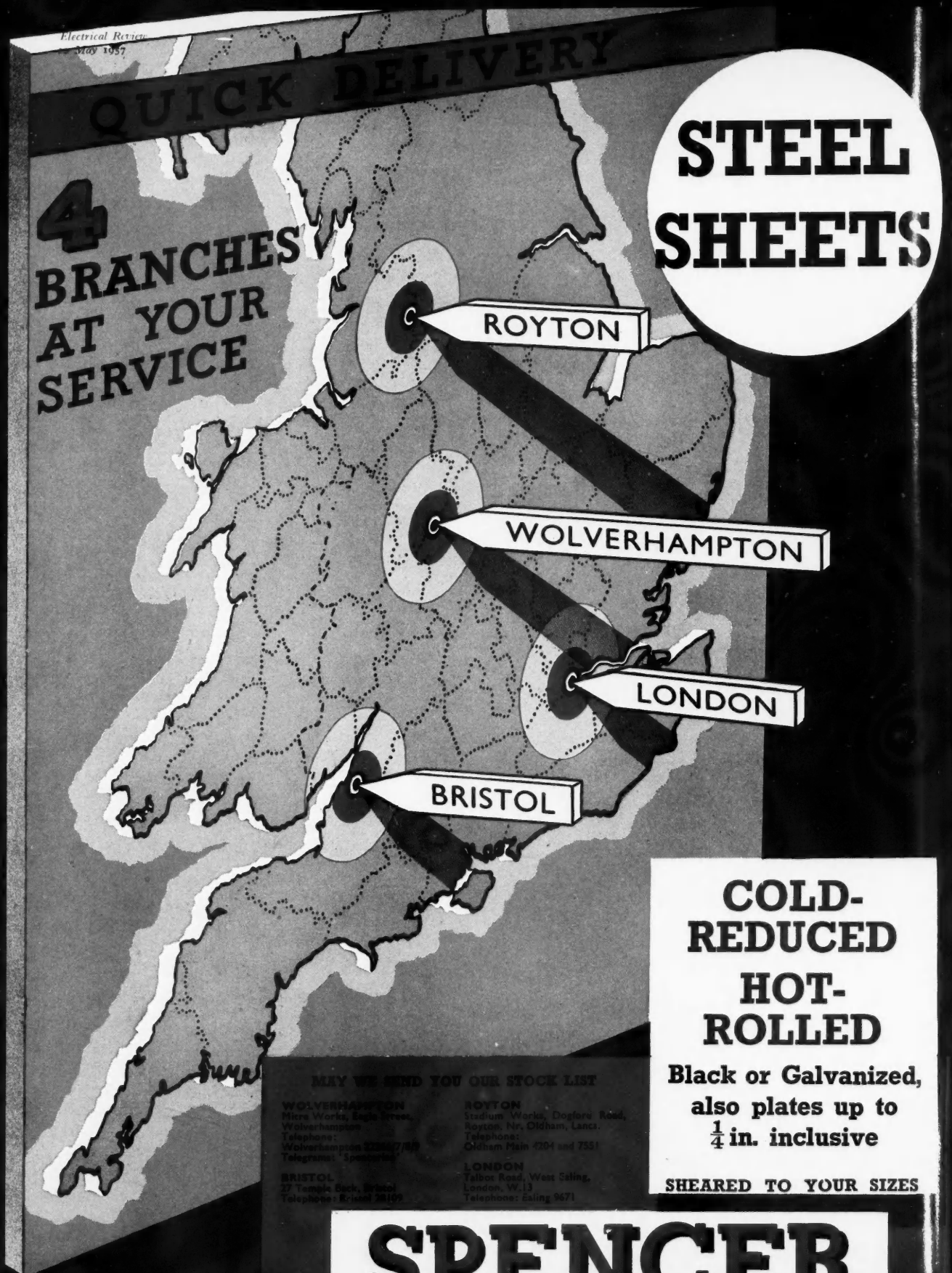

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ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

In This Issue

Electrical Research	**847**	The Electrical Research Association has recorded a solid year's accomplishment representing an excellent return on the funds entrusted to it, but if it is to continue to fulfil its functions a substantial increase in income is necessary
Power Station Buildings	**849**	Besides the savings obtained by the use of larger and more efficient plant units, substantial economies are possible in actual building costs
Southern Diesel-Electrics	**852**	Description of new six- and twelve-unit trains being introduced on the London-Hastings route
Spreading Electricity through Uganda	**857**	Comprehensive distribution schemes and preliminary plans for further hydro-electric development
Development Progress	**866**	Annual report of the British Electrical Development Association and speeches at last Tuesday's annual luncheon
Instruments, Electronics and Automation	**868**	Review of the many new and improved types of apparatus to be seen at Olympia
Atomic Stalemate ?	**879**	Some clarification of the confused state of nuclear power development in the United States, reproduced from *The Economist*

✧ ✧ ✧ ✧

E.R.A. Annual Luncheon	**854**	**Generation and Development**	**881**
Research on Dielectric Materials	**855**	**New Electrical Equipment**	**882**
Lords Debate Electricity Bill	**856**	**Industrial News**	**884**
Questions on the I.E.E. Regulations	**858**	**Financial Section**	**888**
Views on the News	**859**	**New Patents**	**892**
Engineering Wages	**860**	**Contract Information**	**893**
Personal and Social	**865**	**Next Week's Events**	**894**
Factory Equipment Exhibition	**878**	*CLASSIFIED ADVERTISEMENTS*	**101**
Machinery Trades Convention	**880**	*INDEX TO ADVERTISERS*	**114**

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ELECTRICAL REVIEW

10 May 1957 Vol. 160 No. 19 Established 1872

Electrical Research

IT is unfortunately true to say that many industrialists in this country still regard research as somewhat of a luxury and, as a consequence, they are loth to spend more money than they are obliged to in this direction. This is a short-sighted policy because under present conditions it is essential for us to pursue vigorous programmes of research and development if we are to maintain our present position in the world. Research depends upon the amount of money available for it and although it does not give an immediate cash return it is a sound investment which eventually produces benefits and ensures progress.

We detect a note of warning on these lines in the Annual Report of the British Electrical and Allied Industries Research Association, which was reviewed in our last issue. The E.R.A., to give it the familiar initials, has recorded a solid year's accomplishment representing an excellent return on the funds entrusted to it. Good progress has been reported in all the major fields of electrical materials and equipment, surge and interference phenomena, heating problems and rural electrification, and in such outlying parts of the field as wind power and gas cells. Particular attention is being paid to safety problems and to research on materials to withstand continually higher temperatures and stresses.

The long-planned scheme for a new laboratory at Leatherhead has at last reached fruition. Delayed by the war and then by the change in the organisation of the electricity supply industry, it was approved in its final form in 1953 and the move from Perivale was completed during June of last year. With this accomplished the Association finds itself for the first time in the possession of an up-to-date research establishment built for the job and reasonably adequate for the full volume of work now in hand or envisaged.

Whether this volume is itself adequate to the real needs of the electrical industry for co-operative research may well be doubted. Obviously the tempo of the Association's work depends largely on the rate at which the money flows in and less urgent problems have to be put aside for lack of funds. It is true that very extensive programmes of research are undertaken by manufacturers to meet their particular needs, but when a problem touches a wide range of interests a joint attack is likely to prove more effective and more economical.

It is disappointing to note in the present E.R.A. Report that there was a deficit on the year's working and because of increases in costs at the new premises at Leatherhead the adverse margin between present income and estimated expenditure in 1957 is expected to be considerably greater than in 1956. Thus, if the E.R.A. is to fulfil its function, a substantial increase in income is necessary. Membership of the Association

has continued to increase although not so rapidly as could be desired. Many organisations still fail to realise that by making proper use of the membership facilities they can obtain far greater value than the amount of their subscription or what that amount would procure in terms of additional staff.

I.E.A. EXHIBITION

The Instruments, Electronics and Automation Exhibition now being held at Olympia is the first full scale and comprehensive show which these industries have staged in London. One feature of the exhibition which makes it more interesting than many exhibitions of this kind is the effort which is being made to answer, in simple terms, the questions of the man in the street. Apart from being a serious exhibition of scientific devices, the many demonstrations extend its appeal to a wide section of the public. Visitors can, for example, pit their wits against electronic brains at noughts-and-crosses and there are electronic "tortoises" which can be attracted by a light, negotiating their way around obstacles placed in their path. There is the elusive golden ball, which is electronically whisked away when a hand is reached out to grasp it, and many other devices which illustrate the application of electronics and automatic control in an interesting not to say amusing manner. World-wide interest is being shown in this exhibition and there can be no doubt that the manner in which so many original and highly technical ideas are presented will do much to stimulate confidence in British manufacturers.

ENGINEERING WAGES PROPOSALS

Probably by the time this appears the engineering unions will have made their decision upon the recommendations of the Court of Inquiry published last week. Their choice lies between a 5 per cent unconditional wage increase or one of $6\frac{1}{2}$ per cent contingent upon the acceptance of certain terms including a "standstill" for a year and an undertaking to encourage productivity in various ways. The Confederation of Shipbuilding and Engineering Unions had asked for a 10 per cent increase.

We have doubts about the effectiveness of such undertakings, even if the trade union leaders do their best to implement them. The Court itself does not think it possible to link wage movements with measures of productivity. The proposal of the similar 1954 Court for the setting-up of a joint body to keep wages and conditions under periodic review is endorsed and the possible constitution of such a body is outlined. Whether the views of both sides have altered sufficiently since 1954 to cause them to accept the proposal remains to be seen.

SHORTAGE OF TECHNOLOGISTS

The schemes for overcoming the shortage of technologists in this country introduced in the last six years do not seem to be bearing much fruit yet and perhaps we have still not got down to the kernel of the problem. Sir Arthur Whitaker, president of the Institution of Civil Engineers, at last week's annual dinner of the Institution, said that although he encouraged young engineers to seek experience abroad, if the present movement of young engineers to such countries as Canada arose from limitations on engineering works at home, as he believed it did, the country would suffer a permanent loss.

Engineers in the past had lived and grown on competition, yet in recent years we had seen the growth of nationalisation with its elimination of much of the rivalry which once stirred our imaginations. Did not this rivalry accelerate engineering development as well as create public interest and was it not worth while? It seemed to him that we should get back to individuality, to both national and international independence, and to a way of thinking which incited our engineers to greater and more productive efforts. Actually engineers were succeeding in widening the field of their activities, as was instanced by Britain's lead in the building of atomic power stations.

EUROPEAN FREE TRADE

Views on the possible effects of the European Common Market and Free Trade schemes upon the electrical engineering industry were expressed by Mr. Leslie Gamage (G.E.C.), president of the Institute of Export, in a recent *Sunday Times* article.

Mr. Gamage said that although some European manufacturers would be better placed to compete in our home market the process would be gradual and the rising efficiency of our industries must be ensured to compete with European industry at home and abroad. He said that this depended in no small degree upon a prosperous home market. He also suggested that some rationalisation in the electrical industry was inevitable.

Nevertheless Mr. Gamage was unafraid of the future, saying that

> "in the light engineering field we have little cause for fear. In electrical appliances, for instance, we are impressively strong and more diversified in manufacture than anyone else in Europe. In heavy electrical engineering we can hold our own against European manufacturers in fair competition. And, most significant of all, we lead the world in the peaceful exploitation of nuclear energy."

E.I.B.A. NEEDS

Last year the Electrical Industries Benevolent Association incurred a deficit of over £5,000. Welfare grants amounting to £53,355 were made to 566 non-manual workers in the industry and their dependants and this year if the Association is to meet the needs of the industry's unfortunates it will have to spend much more.

It may be thought by some that the E.I.B.A. should cut its coat according to its cloth, but we believe that it is only by doing a little more each year that the industry can be brought to realise the need and come to the rescue. In any event to do what it hopes to do this year the Association will need an extra £14,000 which it confidently hopes the industry will provide. Firms are reminded that subscriptions to the E.I.B.A. are properly chargeable against income tax and they and individuals should also remember that under seven-year covenants the Association can reclaim income tax. The address of the E.I.B.A. is 10, Buckingham Palace Gardens, London, S.W.1.

Power Station Buildings

Possible Methods of Achieving Economy in Construction

By C. BOTTRELL, A.M.I.E.E.*

GREAT strides have been made in this country in the past few years in the development of larger and more efficient power station plant units. Boiler design and manufacturing techniques have developed to the stage where boiler availability is comparable with that of turbine plant, so that "unitisation" of boiler-turbine plant with no spare boiler capacity has become standard practice. The increasing size of these boiler-turbine units has enabled substantial reductions to be made in the plant capital cost, which have more than offset the additions in capital cost which arise from the greater complexity of these plant units due to the use of higher pressures and temperatures for greater efficiency. Apart from these overall plant cost savings substantial economies have been made in overall building costs and it is intended here to draw attention to what has been achieved in this direction, both as regards the reduction of building size per unit capacity and the economy of the use of building materials.

Building Volumes

The main building of a power station consists essentially of a strong framework which is required to support the plant, cranes, auxiliaries, etc., and to this framework may be applied some form of weatherproof cladding around the sides and roof. The design of the framework is dictated largely by the requirements of the plant to be supported and only to a lesser extent by the function of supporting the weatherproofing. This is an important difference compared with a building constructed primarily for weatherproofing purposes, and therefore with power station buildings the cost of the weatherproof cladding, together with that part of the superstructure framework which is required to support it, as distinct from supporting plant, forms a much smaller proportion of the total building costs than with other types of building. For this reason a comparison of the relative building volumes which are commonly used as a basis for assessing the relative order of building costs in the building trade must be used with more caution when applied to power station buildings. However, provided the use limitations of the building volume assessment are clearly understood the data are useful to give an approximate first order indication of relative building costs. For accurate assessments of cost differences it is necessary to take the relative detailed design features of the buildings which are being compared into consideration.

It is, of course, vitally important to have a common basis for comparison, otherwise figures are valueless. The Central Electricity Authority have given building volume and plan area data for new power stations which were designed from 1944 to 1952 to the Beaver Committee, and these data were published by that Committee in their report† which was issued in 1953. These data were compiled on the following basis:—

(*a*) Main buildings only were included, that is workshops, stores, office blocks, external pumphouses, etc., were excluded.

(*b*) Dimensions were taken between inside walls and to the underside of the roof and included basements, if any, but excluded excavations as for circulating water and cable culverts.

(*c*) Where the plant was only partly housed the building volume was determined as accurately as possible from the dimensions of the actual enclosure.

(*d*) The plan areas corresponded to the volumes and did not include any outside plant not under a roof.

This is the basis which is used generally by the Central Electricity Authority for their comparisons.

Compact Layout

When studying the data which are published by the Americans in their various publications it is clear that the figures they quote for their power station plants are not on a common basis, and some reserve must therefore be made when comparing these figures against each other, and also when comparing them against the Central Electricity Authority's figures for their stations. For example, it seems to be the practice with some American undertakings to measure building volume from ground level only and to omit basement volumes. There is some logic in this if the figures are used only to compare building superstructure volume, but if they are used to indicate relative costs they might be very misleading; indeed, for instance, a station with a very deep basement excavated at great cost would have a lower building volume than the station with no basement at all.

In developing the general design and layout of the station the aim is to obtain the most economical arrangement of plant and buildings consistent with the provision of adequate weather protection for the plant and adequate space and working conditions for the operation and maintenance of the plant. The most economical arrangement is, in general, the most compact arrangement,

Type	Steam Cycle	Turbine House	Boiler House	Total
		cu. ft/kW	cu. ft/kW	cu. ft/kW
30 MW sets with multiple boilers (stoker fired) ..	600/850	25	25	50
60 MW sets with multiple boilers (p.f. fired)	900/900	24	34	58
30 MW units (p.f. fired) ..	600/850	16	24	40
60 MW units (p.f. fired) ..	900/900	15	17	32
100 MW units (p.f. fired) ..	1,500/1,050	11	17	28
120 MW units (p.f. fired) ..	1,500/1,000/1,000	11	17	28
200 MW units (p.f. fired) ..	2,350/1,000/1,000	11	17	28

* Formerly with the C.E.A., Operations Headquarters, and now with the English Electric Co.

† Report of the Committee of Inquiry into Economy in the Construction of Power Stations—H.M. Stationery Office, 1953.

because apart from producing savings in building cost, compact layout also enables economies to be made in plant costs, e.g. pipework, cabling, ducting, etc.

The building volume per kW required by the various plants in this country in the past few years, leading up to the largest units so far committed, that is, 200 MW, is given in the table on page 849, and the relative plan and elevation outlines for 4-unit stations of from 30 to 200 MW per unit are shown on the facing page. These figures clearly bring out the plant size effect with the unit plants and the effect of "unitisation." They are, in fact, for normal conventional type stations with the main plant fully housed and do not include semi-outdoor plants, of which one is now in service and others are under construction. It is the practice, however, with conventional type stations to arrange for some of the ancillary plant, such as electrostatic precipitators, induced draught fans and sometimes the air heaters, to be outdoors.

Developments in Design

The plant manufacturers have contributed in no small measure to the progressive reduction in these building volumes in the development of plant designs. With turbo-alternators the development of inner hydrogen gas cooling of both stators and rotors has enabled very considerable reductions to be made in dimensions and weight per unit capacity. In fact, the alternator for a 200 MW unit with this method of cooling is very little larger than for a 60 MW air-cooled unit. The development of turbine blading design, larger exhaust areas and the use of higher steam cycles have also enabled reductions to be made in overall turbine dimensions. With the later 200 MW units the emphasis has been to obtain the maximum thermal efficiency.

Dimensions and their effect on building costs must, of course, be taken into account in assessing the merits or de-merits of particular designs, although with high performance plant which is required to operate at a high load factor over a large part of its life the value of a slight improvement in performance might easily account for any additional building costs which might arise from longer plant. However, it is suggested that when the limit of performance is reached with a particular design, the designers should then concentrate on ways and means of modifying the design to reduce overall dimensions without detriment to performance. It is an interesting fact that the space required for the feed heating and ancillary equipment is a much greater proportion of the total turbine room space with the 200 MW units than with the smaller units.

The boiler manufacturers are tackling an extremely difficult problem in this country in designing plant to burn low grade coal with high ash and fairly high chlorine and phosphorus contents. It is unfortunate that the only developing coalfields where, for general economy reasons, the larger coal-burning power stations are being erected, produce this very poor coal. The boiler furnaces for these fuels are necessarily liberally rated and most of the boilers have divided furnaces for capacities above 100 MW, while the 200 MW boilers have twin furnaces arranged side by side. It seems that until there is some further major development in boiler design there is very little prospect of reducing the dimensions of this plant. The figures in the table show that the boiler house building volume per unit capacity has remained constant for each of the unit sizes from 60 MW to 200 MW inclusive.

General arrangement and layout is not a precise science. There may be numerous ways of arranging the plant, each of which may be equally good depending upon the emphasis placed on any particular aspect by each designer. Layout is often dictated by site and construction considerations. However, there must be general agreement on the desirability of further reducing building volumes provided these reductions are consistent with a corresponding reduction of building costs. Although there appears to be some fairly substantial capital economies to be made from the adoption of outdoor or semi-outdoor main plant, there is hesitancy in the use of this type of plant in this country on a large scale because of the very fickle climatic conditions. There does not appear to be a case here at all for outdoor turbine plant although it is quite common in the more temperate states of North and South America. The only scope there appears to be in this country for outdoor plant is on the boiler side.

The conception which has been adopted for the boiler plants designed in this manner in this country is that all parts of the plant which require routine access for either operation or maintenance are adequately protected from cold or wet weather and all other parts of the plant are exposed. The adoption of this technique gives a reduction of building volume of the order of 5 cu ft/kW with 60 MW units and about 8 cu ft/kW with 100 MW units. The saving in building costs is extremely difficult to assess but the indications are that it might range from about £1 to £2 per kW, depending upon the basis of comparison. For instance, the saving where brickwork is used would be a little higher than where simple lightweight sheeting material is used. Some of the capital saving in building cost is set off by the additional provisions which have to be made in the plant against ingress of water during wet weather and frost. There is also the possibility of a slight reduction in thermal efficiency owing to the loss of some of the heat radiated by the boiler casings, which in the conventional station is reclaimed to some extent by the forced draught fans. One of the semi-outdoor plants is now in operation, and it will be possible after a reasonable period of service to decide from experience whether this type of plant has a future in this country. This plant has been very adequately described, together with the design philosophy, in the I.E.E. paper "Some Design Features of the Semi-Outdoor Power Station at Ince."

Arrangement of Plant

With conventional enclosed plants and for units up to about 120 MW capacity it is fairly general to arrange the turbo-alternators across the turbine room, because the overall length including space for withdrawal of the rotor is greater than the dimensions required for the boilers. This transverse arrangement has the merit, therefore, of enabling centres between units to be determined by the smaller dimensions required by the boilers, so that no waste space is built into the boiler house to obtain a uniform arrangement of pipework and steelwork for each unit. The first 200 MW unit station which is being designed will, however, have a longitudinal arrangement of turbine because it is possible, even though these are tandem compound machines, to arrange them in this way and to provide a uniform piping arrangement for each unit without having to increase the boiler centres.

Building space and volume can easily be made excessive by over-elaboration of access space for operation and maintenance requirements. It is, of course, absolutely essential to make adequate provisions and space for removing and handling plant parts. However, these provisions should be established by a rigorous study of the incidence and manner in which maintenance of the various plant parts should be carried out. For instance, there should be space in the turbine room for putting

down top half cylinder covers during maintenance of the turbines but it is not necessary to provide such a space for every unit. For stations with four to six units spaces for two covers are adequate. Loading bay dimensions should also be carefully considered to ensure that the provision is adequate yet not excessive. The height of the turbine room should be determined solely from functional considerations, that is, provision for lifting any item of plant into position with the turbine room crane with adequate clearance. There should be no consent to increases in this dimension for architectural or æsthetic reasons. It is possible also to reduce the turbine room width by arranging for skewed rotor withdrawal or by making provision for withdrawal into an annexe or into a space created by removing some of the turbine room wall cladding.

In the boiler house there must be adequate space provision and access around the plant for operation and maintenance such as tube replacements, soot blowing, mill maintenance, etc. Also, there must be adequate ventilation; with large units up to 200 MW capacity the ventilation problem becomes acute and requires very careful consideration. The general arrangement of the plant and the dimensions of the building should be determined having regard to these considerations but should not have any additional margins, since these are particularly costly in the boiler house. This applies particularly to the cases in which the boiler is supported from the building steelwork, which is common practice with large units.

The building volume figures in the table include the building bay in which the bunkers are situated. The bunkers are generally supported over the pulverising mills to feed by gravity and are usually of about 24 hours' maximum capacity. The plan dimensions of the bunker bay are determined by the space requirements of the mill plant and these requirements often also determine the dimensions between the boiler centres, if a single row of mills is adopted.

It has been mentioned previously that it is the practice now to arrange for the precipitators, induced draught fans and sometimes the air heaters to be outdoors. This has made a substantial reduction in building requirements. The Ministry of Fuel and Power statutory consent to the construction of a new station usually includes a condition that provision shall be made in the layout for the possible future addition of plant for the removal of sulphur fumes, if it is required by the Ministry at some future date. This provision is usually now made by leaving a space behind the chimneys, but there were numerous instances in the past where accommodation was provided within the boiler house building. This was obviously an expensive way of making provision for plant whose scale and dimensions are undetermined which could be put outdoors in any case.

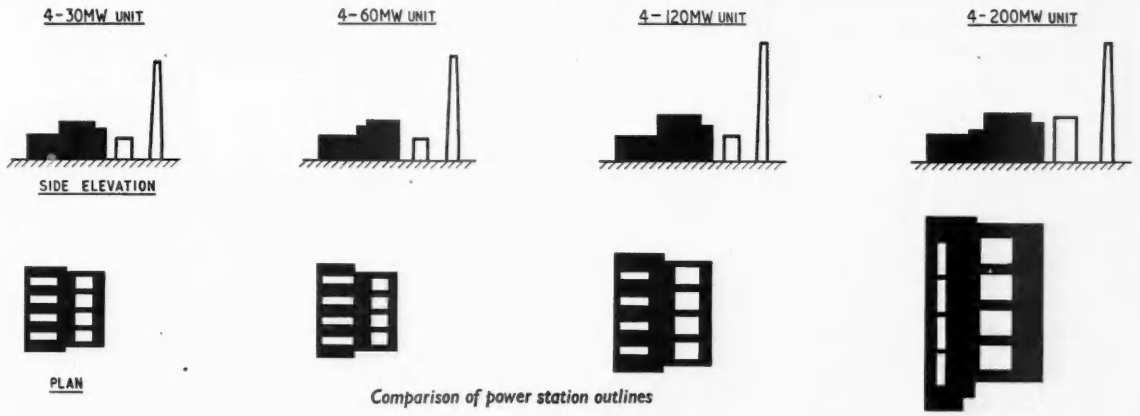
Economies in Building Cladding

There is a great deal of misconception about the possible economies in building cladding. For the reasons mentioned earlier the greatest scope for economy in buildings arises from keeping the dimensions of the building framework down to the minimum. The actual cost of the cladding of the buildings is a comparatively small part of the total cost of the station. However, there is some scope for economy in the use of cladding materials which is well worth pursuing.

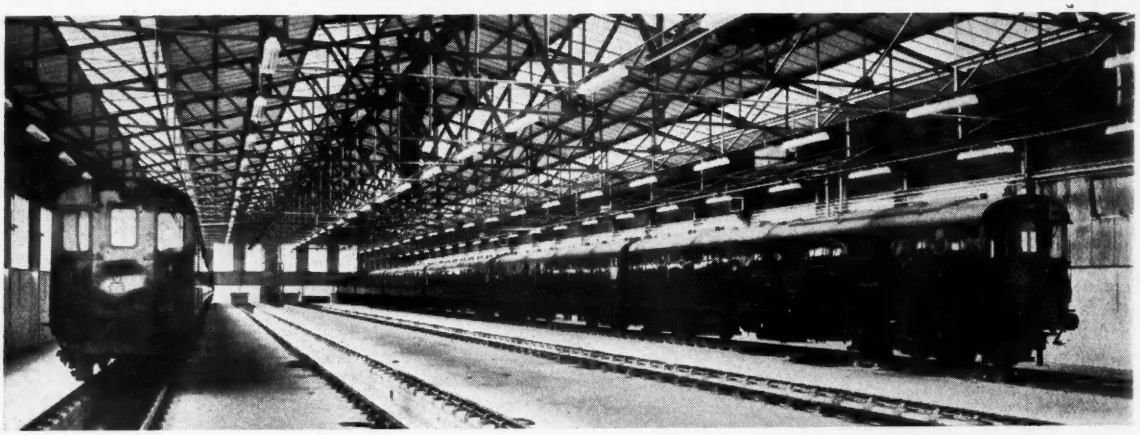
It was fairly general practice to use brickwork for power station superstructure cladding up to about 1950, when, owing to the shortage of bricks and the need for economy, attention was given to other forms of cladding materials. It is the policy, directed by the Government for A.R.P. reasons, that building construction materials up to the height of the top of the turbine casing shall be of solid form, either brickwork or concrete blocks. A station with no basement would therefore have solid construction up to about 35 to 40ft from ground level. The use of lightweight cladding materials is consequently restricted to the building superstructure above this level. The turbine room presents a problem in so far that this room must be heat insulated to prevent condensation in and around the plant. The various lightweight cladding materials which are available, such as asbestos or aluminium sheeting, etc., require an additional insulating medium for this purpose and experience shows that there is not very much saving on this type of construction compared with brickwork. However, it is rather different for the boiler house where simple uninsulated sheeting is practicable. The saving with lightweight cladding here is fairly substantial.

Since 1950 it has therefore been the general practice to use lightweight sheeting for main power station buildings except in those cases where the station is sited in a very exposed position on the sea front. In these situations it is considered that brickwork or some other form of solid block construction is still the most appropriate. The use of lightweight materials has enabled the architects to produce a different kind of architecture from the monumental style which typified the power station buildings of the immediate post-war era.

The modern style is aimed to express the function of the power station in a simple, light, yet pleasing manner.



Comparison of power station outlines



Southern Diesel-Electrics

PARTICULARS OF NEW MULTIPLE-UNIT STOCK

IN order to improve the service on the heavily-loaded London to Hastings via Tunbridge Wells route the Southern Region authorities decided to substitute diesel-electric multiple-unit trains for the steam services. Regular operation of four of these trains in the place of three steam trains is to begin on 17th June, when the summer services are put into operation (raising the number of seats by 30 per cent), and it is aimed to complete the substitution entirely in the ensuing twelve months. Last week we took part in a trial run of one of the new trains and found it to be smooth riding although there was some vibration in the motor coaches themselves.

Each train consists of a motor coach at each end with four intermediate coaches and two of them can be coupled together to form a twelve-unit train. The first-class compartments are tastefully panelled and upholstered and have a side corridor. The second-class coaches are quite as comfortable and are of central-corridor design.

The tare weight of a six-coach unit is from 222 to 227 tons and the seating capacity from 242 to 288. The underframes and bogies are being built at the Ashford Works of the Southern Region and the coach bodies and interiors are being finished at the Eastleigh Works.

Above: Two of the new Southern Region multiple-unit diesel-electric trains in the specially-erected maintenance shed at St. Leonards

Left: Driver's cab, showing control desk

In each motor coach there is an engine room housing an English Electric 4SRKT/II pressure-charged four-cylinder diesel engine developing 500 b.h.p. at 850 r.p.m. This is direct-coupled to an English Electric six-pole 330 kW generator and an overhung 13·2 kW six-pole auxiliary generator supplying electricity at 90 V for lighting, control gear and battery charging. The main generator has a continuous rating of 600 A at 550 V; its output is controlled by an English Electric auto-load-regulator which also governs the traction motor field weakening. There are four engine speeds—450, 620, 750 and 850 r.p.m.—and the regulator controls the engine output at the three highest speeds to approximately 330, 420 and 500 b.h.p.

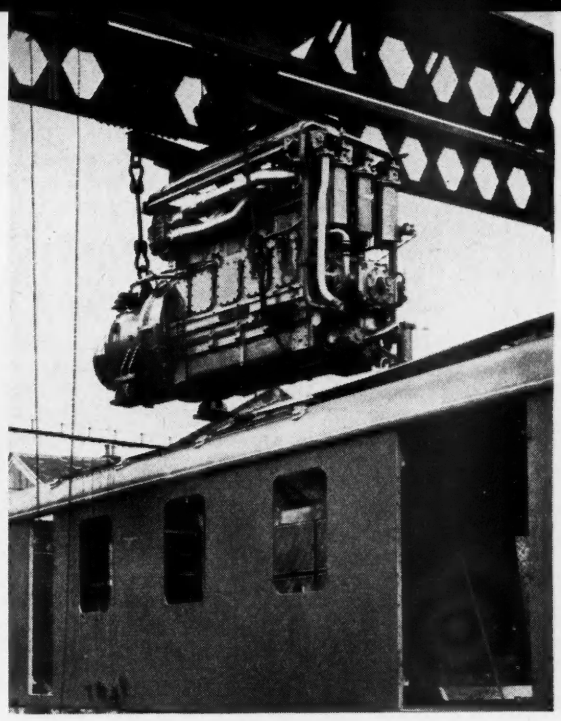
The driver's master controller has a master switch handle controlling movement and direction and a main power handle. There are four positions for the master switch handle—" off," " forward," " engine only " and " reverse," and a deadman's handle is operative in the " forward " and " reverse " positions. The main power handle has seven power notches and " off " position.

Power from the main generator goes to two four-pole nose suspended axle-hung traction motors on the rear bogie of the motor coach; they have a continuous rating of 205 h.p. each and are connected in permanent parallel. They are interchangeable with the motors used on the latest electric stock of the Southern Region. A maximum speed of 75 m.p.h. is attained.

On the underframe between the two bogies are suspended fuel tanks, air reservoirs, a 90 V Westinghouse D.H.25 air compressor and two 92 Ah (5-hour rate) D.P. 40-cell batteries—one for starting the engine and the other for lighting. Air brakes of the Westinghouse automatic and self-lapping electro-pneumatic type, similar to those on the Southern multiple-unit electric stock, are used.

The coach heating is electric—a combination of convectors and radiators—and is under thermostatic control

Right: A 500 h.p. power unit being lowered into position



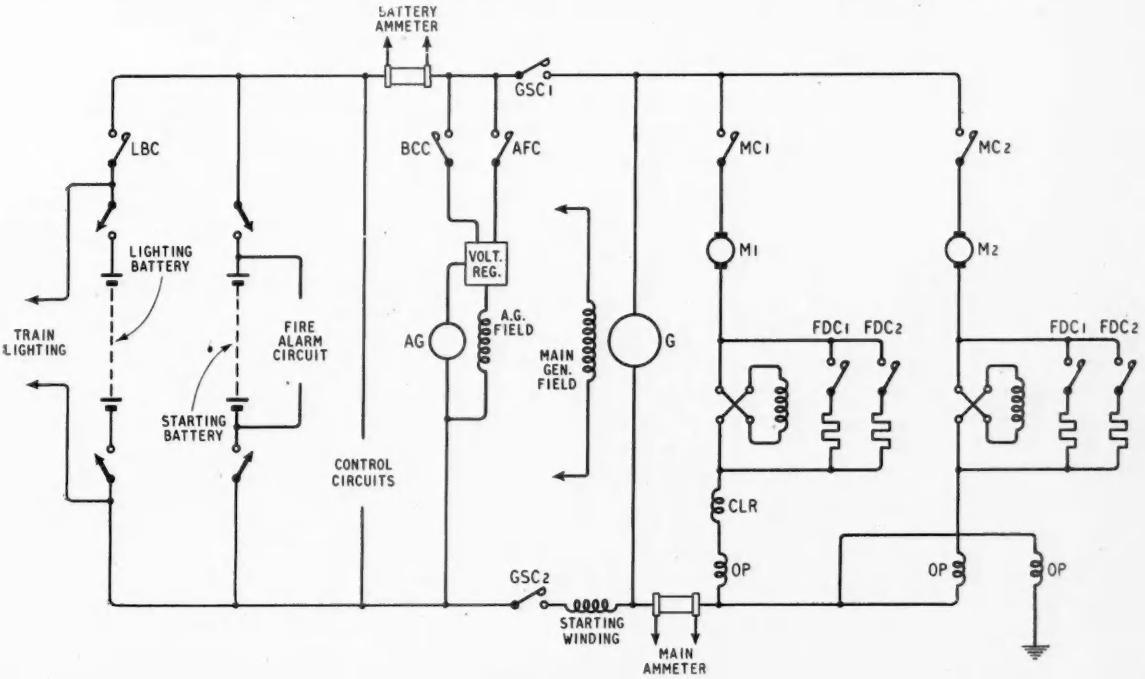
Below: Interior of second-class open saloon

to keep the temperature at 65 deg F. A combination of roof and shoulder type fittings provides the lighting.

The layout of the controls in the driver's cab is similar to that employed in the latest electric stock. There are a master controller and a brake controller, the latter being for the electro-pneumatic and Westinghouse brakes and auxiliary apparatus. The control equipment consists of electro-pneumatic and electro-magnetic contactors and group switches. All the power contactors and relays are in a case suspended from the underframe, while the rest of the control gear is housed in an auxiliary cupboard in the driver's cab.

For the maintenance of the new stock a special shed has been erected at St. Leonards. This is 440ft long and 87ft wide with a height to the eaves of 37ft at the closed end for a length of 100ft and 16ft for the remainder. In the high portion lighting is by 1,000 W tungsten filament lamps and in the lower portion by 80 W fluorescent lamps. There are push-button controlled ventilating fans for the removal of exhaust gases. As a means of protecting the steelwork from the sulphur in the exhaust gases and from the sea air, unit heaters are installed to blow hot air into the roof space. They are automatically controlled by humidistats and thermostats. The usual services have been provided and there are two battery chargers.

Diagram of power and auxiliary connections. G, Main generator; AG, auxiliary generator; M 1 & 2, traction motors; AFC, auxiliary field contactor; BCC, battery charging contactor; CLR, current limiting relay; FDC 1 & 2, field diverting contactors; GSC 1 & 2, generator starting contactors; LBC, lighting battery contactor; MC 1 & 2, motor contactors; OP, overload protection relay



E.R.A. ANNUAL LUNCHEON

NUCLEAR POWER AND THE ELECTRICAL INDUSTRY

PROPOSING the toast of the Association at the annual luncheon of the British Electrical and Allied Industries Research Association on 1st May, Sir Christopher Hinton pointed out that the atomic energy programme made no direct contribution to electrical engineering; the development of nuclear power merely provided an alternative source of heat to supplement our resources of coal and oil, and it might even be suggested that the new nuclear power techniques, because they were not at present capable of achieving the same initial temperatures in the heat cycle, were putting back the technology of design of certain sections of the power plant by something like twenty years. Nor was the energy generated from the first nuclear power stations cheaper than that generated from conventional stations which would go into operation at about the same time.

It was hardly to be expected, however, that an infant development could from the outset compete with its adult alternatives. When the future of nuclear power was surveyed, it was obvious that its importance could not be over-estimated. The reactors being built to-day for the electricity authorities represented a tremendous advance over Calder Hall, and beyond them it was possible to forecast with certainty improvements which would come into use in the next decade which would lead to higher top temperatures in the steam cycle, reduce capital costs, increase thermodynamic efficiencies, achieve longer working lives for the fuel elements, enable higher fuel element ratings to be used, and make practicable larger as well as smaller reactors.

Cost Forecast

Making a conservative estimate of the effect of these improvements on the cost of electricity from nuclear power plants, it was reasonable to expect that the nuclear power stations going into operation in 1965 would produce electricity appreciably more cheaply than the conventional power stations which would be commissioned at that date, and that by 1980 the cost of nuclear power would be about half the cost of that produced by the use of conventional fuels, assuming that the upward trend in the cost of conventional fuels continued. The general effect of nuclear power on the generation, distribution and use of electrical power, therefore, was bound to be tremendous.

Few nations in modern times which were not importers of fuel had achieved industrial and international greatness. There was little hope of building up coal production in the United Kingdom to meet the expanding demand, while imports of oil were secured under conditions which were precarious and caused a drain on our financial resources. In these circumstances there was a strong possibility that well before the end of this century there would be a tremendous swing to the use of nuclear fuels, which would go to the point where domestic space heating, for instance, would be done by secondary heat obtained from fissionable fuels and transmitted in the form of electrical energy.

The rapid advance in the development of atomic energy had been made possible only by extremely close collaboration within the teams of scientists, metallurgists and engineers. He believed that this experience in the organisation of industrial development was at least as valuable as the material progress which had been made. There had always been good collaboration between the scientist and the engineer in the electrical industry. At the theoretical end of the industry their fields lay close together, and this led to a unison between them which was not evident in every industry. The reliability of plant sold to the customer depended not on science but on the art of engineering and the observance of well-established workshop practices. When turbo-alternators and switchgear gave trouble it was not because the underlying theory was inadequately understood but because the designer failed to acknowledge principles of practical engineering which had been well established before he was born.

Conventional Plant Still Needed

Sir John Hacking, who replied in the absence of Sir Gordon Radley, through ill-health, said that from a very early stage it had been obvious to the Central Electricity Authority that there was little hope that the country's future demands for energy could be met by burning coal. They had therefore welcomed proposals for using the heat from nuclear energy. He had no doubt that for high load factors the use of nuclear energy had a very great future. Against the high capital cost could be set relatively low running costs, making it suitable for base-load plant. It did not seem at all certain, however, that nuclear energy plants would oust thermal plants for relatively low load factor operation, and he thought that a considerable additional capacity of thermal plants would be required to meet the demand.

The electricity supply industry had done a first-class job, in association with the manufacturing industry, in building up an enormous increase in the installed capacity of generating plant each year. The manufacturing industry had probably multiplied its total output by at least a factor of three, and in doing so increased its contribution to our export trade very greatly. "Now," Sir John said, "we are about to receive our reward. The manufacturing industry is being presented with a little parlour game called 'Monopoly,' and the supply industry with an additional boardroom table. Perhaps we can combine and play 'Monopoly' on the boardroom table! I do not think that the services which we have rendered to the community have always been adequately recognised."

Association's Finances

Dealing with the affairs of the E.R.A., he said that a new quinquennial period was beginning in connection with grants from the D.S.I.R., these grants being dependent on achieving from other sources certain specific amounts. He appealed to both the supply and the manufacturing industries, therefore, for a considerable increase in their grants for research. He doubted whether their present grants were adequate to compensate for the effects of inflation. The Association, in order to tighten co-operation with industry, was appointing an advisory board on which the manufacturing industry would be very strongly represented.

In conclusion, Sir John referred to the great loss which

the Association had sustained by the death of Dr. Stanley Whitehead, the director of E.R.A., and mentioned that Mr. H. G. Taylor had been appointed to replace him.

The toast of the chairman was proposed by Mr. F. H. Bramwell.

Annual Meeting

In presenting the thirty-sixth annual report of the Association (*Electrical Review*, 3rd May, page 817) the chairman, Mr. F. H. Bramwell, announced that the official opening of the new Leatherhead Laboratory had been fixed for 26th June, and Lord Mills, the Minister of Power, had agreed to perform this ceremony. The Council had decided to combine the event with an "open day" for members and visitors. The number expected to wish to visit the new Laboratory was so great, however, that it would be necessary to have a second open day the next day.

It was the intention of the Council that ultimately the whole of the activities should be accommodated on the Leatherhead site in order to reduce overhead expenses to the minimum and to ensure maximum efficiency of effort.

At the present time the high-current and switchgear sections were still housed at Perivale, and under the agreement with the purchasers they had the right to retain the portion of Perivale occupied by these activities for a further two to six years at the option of the Association. The Council had agreed to sell to the Central Electricity Authority a corner of the Leatherhead site to enable the Authority to extend its research establishment which was at present on a congested and inadequate site also in Leatherhead.

Those who were being invited to serve on the Advisory Research Board were all men whose ability and experience in the broad field of electrical research commanded the respect of the scientific and industrial worlds. The Board was purely advisory and would have no executive powers, which still remained with the Council. It was hoped that the establishment of this Advisory Research Board would be of assistance in ensuring that the work being carried out by the Association was on the right lines to be of maximum value to all interests covered by the wide membership of the Association.

In 1961, the last year of the present quinquennial period, the required grant-earning income would be 65 per cent above the present estimate for 1957; the total would be a little over £300,000 and would thus meet the terms of the D.S.I.R. to qualify for the grant of £100,000 in that year.

This estimate made no allowance for further depreciation in the value of the pound; if this changed at the rate of the past few years the percentage increase required by 1961 might well be 100 per cent instead of 65 per cent.

The accounts showed that the total income last year was £361,816 and the expenditure £378,024, giving a deficit for the year of £16,208, about £3,000 less than the forecast a year ago.

Research on Dielectric Materials

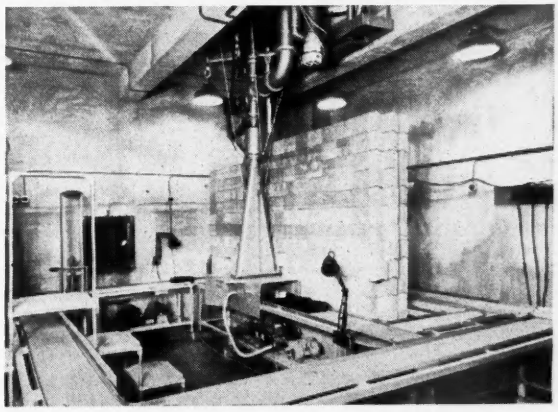
AMONG many research projects now in progress at the Hinxton Hall Research Laboratories of Tube Investments, Ltd., is an investigation on behalf of Mersey Cables, Ltd., into the effects of high energy radiation on dielectric materials that can be used in cables and wires. One of these materials, polythene, is of particular interest because its electrical, physical and processing properties are superior to those of any other industrially available insulating material. It is one of the aims of the present investigation to supplement the existing knowledge of the effects of irradiation on these properties with a wider investigation into the fundamental changes which are induced.

Previous research has revealed that the exposure of polythene to high energy radiation will improve its high temperature properties to a marked degree. Unlike conventional polythene, which melts on heating to 115 deg C, the irradiated material is converted to an elastic rubber-like substance which retains its form and appreciable strength.

This development has an important bearing on wire and cable manufacture, for soldering can now be carried out close to the insulation without damage, and momentary electrical overloads which were formerly responsible for deforming or destroying the dielectric can be tolerated. Moreover, irradiated polythene insulated cable can be employed in applications where its inherent electrical properties are required, but from which normal polythene is excluded owing to local high-temperature conditions.

To support their belief in the future of this development, a new laboratory has been constructed recently by the Group and equipped for the irradiation of materials and the subsequent examination of their post-irradiation characteristics. The focal point of the building is a large, two-storey concrete chamber which houses the Van de Graaf 2 MeV particle accelerator. This installation can be used for bombarding polythene or other materials with electrons. A conveyor belt system, shown in the accompanying illustration, passes materials through the electron beam at a regulated speed.

The operation is remotely controlled from an external panel from which point the inside of the chamber can be viewed through a thick observation window, made up of 41 panels of glass, which protects the operator from



Irradiation chamber showing the lower half of the accelerator and the triangularly shaped electron beam scanner which directs the accelerated particles

any stray radiation. For safety reasons, the whole installation has been enclosed in a 3ft thick concrete shell equipped with a 2-ton lead door.

One of the advantages of irradiation by this method is that as soon as an accelerator has been stopped the material can be removed at once from the chamber and taken to the adjoining laboratories for thorough testing by a highly trained team of scientists and research workers.

Examination of materials using the latest techniques and equipment has proved to be several times faster and more accurate than more conventional methods, a factor which in conjunction with other facilities available has undoubtedly advanced the date on which irradiated cable will become commercially available in this country.

LORDS DEBATE ELECTRICITY BILL

WHEN Lord Mills, the Minister of Power, moved the second reading of the Electricity Bill in the House of Lords last week, he gave the latest news about the project for a cross-Channel cable. "Experimental tests have been successful and the technical problems have been overcome," he said. "The difference between the peak loads in France and Great Britain suggests that there is an economic case for exchanging power at certain times. The departmental scrutiny of this project has almost been completed and the Government hope soon to make an announcement on the matter."

The Minister mentioned this when explaining that the Bill gave the proposed Central Electricity Generating Board the power to supply electricity outside Great Britain, so that exchanges of electricity could be made when it was found to be mutually advantageous.

Going through the provisions of the Bill, the Minister said he did not think that any central subsidy for rural electrification was justified. Central subsidies would disguise the real cost of the service and might cause a less critical attitude to cost by the Boards receiving help and perhaps some resentment by the Boards having to provide the money.

The Herbert Committee did not find that there was any serious lack of balance in the different areas between the rural and the urban loads; therefore the House could be fairly confident that the aim of connecting 85 per cent of all farms would be achieved. The remoter 15 per cent presented special difficulties and it was too early to say how they would be dealt with. There was special power in Clause 5 for Boards, in special circumstances, to generate electricity themselves, and it was possible that small stations, apart from the main network, might be the solution.

Generation by Area Boards

Lord Gridley considered the Bill a good one but capable of improvement. Under the delegated powers the Area Boards should be entrusted with the operation and maintenance of the existing conventional power stations situated in their areas.

Urging caution in considering how far the Area Boards should have power to generate electricity, Lord Hurcomb said it was easy to yield to the popular view and it would be a mistake to allow the Boards to go back to the pre-nationalisation position. But he was attracted by the suggestion that the day-to-day management and operation of many of the conventional stations should be entrusted to the engineers of the Area Boards. Such a decision should be within the discretion of the Generating Board.

Lord Simon of Wythenshawe said that when the nationalised Boards were appointed for only five years and members were not re-appointed there was no continuity, so how could there be any team spirit? Bigger efforts should be made to train people for these Boards in the industries themselves, just as was done in private enterprise companies. It was most important that the five-year rule should be abolished and that appointments should be for longer periods, up to retiring age. Salaries and pensions were notoriously inadequate for the ordinary Board members.

On the subject of salaries, Lord Lucas declared that if the Treasury were to dictate the same scales that they had dictated in other nationalised industries it would repeat the folly which had caused so many troubles in these industries.

Replying to the debate, the Lord Chancellor, Lord Kilmuir, said that if the Area Boards were to operate the power stations in their areas as Lord Gridley suggested they would be subject to a considerable measure of control by the Generating Board which would have to retain responsibility for siting and for national grid control. That would run counter to the main purpose of the Bill which was to advance the autonomy of the Boards. It would also impair the autonomy of the Generating Board itself because part of its functions would be carried out on an agency basis. With such a division of functions it was difficult to see how the Generating Board could be made responsible for making its business pay. It was unlikely that the boundaries of the Generating Divisions would, or indeed should, remain co-terminous with those of the Area Boards. What the Herbert Committee foresaw was a national generating and main transmission system which would no longer coincide with the distribution areas.

The transfer of the operation of generating stations to the Area Boards would also adversely affect the Generating Board's engineering staff. Their prospects of promotion would deteriorate in different degrees, according to whether the Area Board to which they were transferred had many or few power stations in its area. Human nature being what it was, the Generating Board would tend to keep their best engineers and let the Area Boards have the others.

Appointments of Board Members

It was the Government's desire to get the best possible men for the nationalised Boards but it was difficult to appoint members for more than five years. As a matter of practical, political experience the extent to which a Government could commit their successors as to the personnel of these Boards was limited. One must take account of the fact that five years was really the life of a Government. It was not accurate, however, to say that members of Boards seldom served more than one term. Lord Citrine had been chairman, and Sir Henry Self deputy chairman, of the C.E.A. since its inception and among the Area Boards there had only been one case of a chairman or deputy chairman who would have been able to serve again not being re-appointed.

The function of appointing members to the Boards was the most important means by which the Minister and Parliament could ensure that the nationalised industries were being run in the national interest. It was the basic concept that the Minister should appoint men in whom he had full confidence and should leave to them the day-to-day operation of the industries. If the Minister lost this right the result might well be an increase in the interference with the work of the Boards.

On the question of providing higher salaries to attract men of first-class quality and capacity to the electricity supply industry, Lord Kilmuir repeated what Mr. Aubrey Jones said on 17th December. ("I very much regret that the financial and economic situation does not make it possible for the Government to act on this now but the Government are giving very serious thought to this matter.")

Lord Lucas said we could ill afford not to do it. It was because we had not paid for talent that the economics of the country were in their present state.

The Bill was read a second time.

Spreading Electricity Through Uganda

RAPID PROGRESS DURING THE PAST YEAR

LAST year the Uganda Electricity Board sold 82·3 million kWh, 19 per cent more than in 1955, and 2,248 additional consumers were connected. The speed with which electrical development is being carried out in the country is graphically illustrated in the Board's ninth annual report by a diagram showing that in its first year of operation, 1949, sales amounted to only 8·8 million kWh. Comprehensive distribution schemes are taking supplies to remote parts of the country; last year Masaka, in Buganda, and Soroti, in the Eastern Province, two places 320 miles apart which now form the extremities of the Board's supply area, received electricity for the first time. Recently it was announced that a large part of Mengo and an area between Pallisa and Mount Elgon, in the Eastern Province, are to be supplied. Including a scheme for extending the supply to Mityana, the total cost will be over £1 million (see *Electrical Review*, 26th April, page 787).

The township of Mbarara will be supplied by a 750 kW hydro-electric scheme at Kikagati which was purchased by the Board during the year. The scheme, which is situated on the Kagera River bordering on Tanganyika, will also supply a mining syndicate in Tanganyika. The station is designed to take another set, which will be installed in due course.

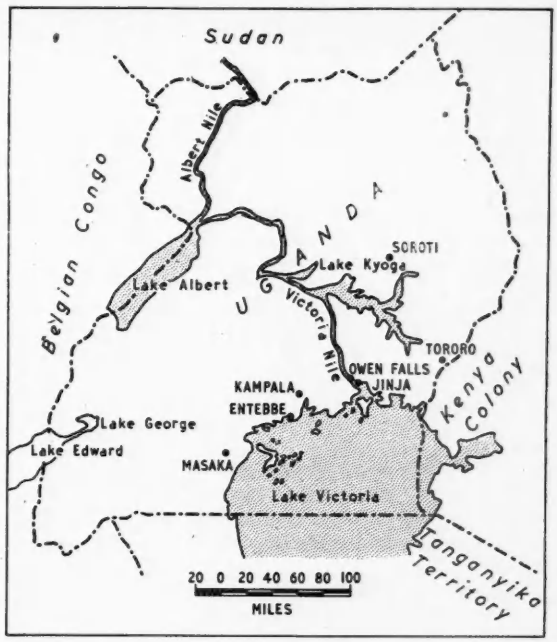
Good progress was made with the erection of the lines forming part of the comprehensive distribution scheme to give a supply to a substantial part of Busoga.

Electrical Appliance Sales

To encourage greater use of electricity the Board decided to sell electrical appliances direct to consumers. Two vans were put into service as travelling shops and offices. Every encouragement is given to manufacturers of electrical appliances who visit East Africa to study local markets. The Board co-operates closely with manufacturers' agents and it was possible with this liaison to arrange a special public demonstration of electrical appliances by a team of expert demonstrators in Kampala.

At the end of last year the capacity of the Owen Falls station was 60 MW; two additional 15 MW sets were then nearly ready for commissioning, while No. 7 set was being erected and the draught tubes and cones of turbines 8, 9 and 10 had been installed. Work was completed on the Nile Bridge railway approach viaduct and the embankment protection, and the level of water between Ripon Falls and the Owen Falls dam was then raised to lake level. To avoid excessive drawdown between Lake Victoria and the dam when the station is completed, some rock excavation will be required and a model is being constructed to determine the amount of excavation necessary.

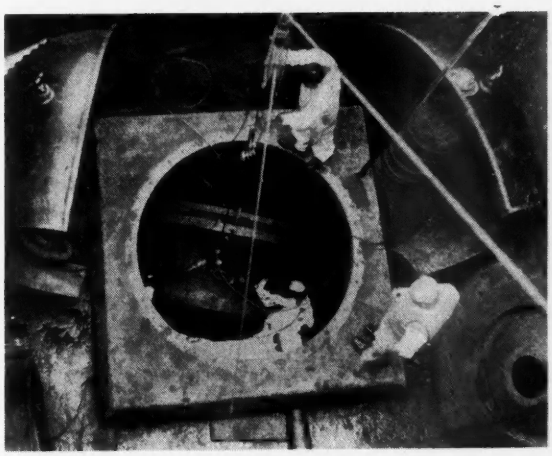
A decision will soon have to be taken on the construction of a second hydro-electric station on the Nile. Sir Alexander Gibb & Partners and Messrs. Kennedy & Donkin submitted a report giving the hydro-electric potential between Owen Falls and Lake Kyoga as 500 MW and trial bores have been made at a proposed power station site some miles below the Owen Falls. The consulting engineers also completed a survey between Lakes Kyoga and Albert and their preliminary report indicates a power potential of between 1,100 and 1,500 MW along this stretch of the river, in three separate developments. With this expansion in mind the Board appointed the Economist Intelligence Unit to prepare an appreciation of the probable course of development and to estimate the growth of demand up to 1970. The Unit's report has now been received and will be published shortly.



Dealing with main transmission, the report records that the first circuit of the Owen Falls-Kampala 132 kV line was commissioned last October, with one 15 MVA, 132/33 kV transformer at Kampala North substation. Both circuits of the Owen Falls-Tororo 132 kV line have been completed and one is in operation at 33 kV.

Thunderstorm frequency in parts of Uganda is among

When the Uganda Electricity Board bought the Kikagati hydro-electric station from Kagera Mines a few months ago its first task was to recover one of the runners which had come off the turbine shaft some years ago and dropped down the draught tube



the highest in the world and creates serious operational problems. Interruptions have been reduced by the use of surge divertors and auto-reclose circuit-breakers and experiments are being carried out with special forms of overhead line construction, the adoption of counterpoise earthing, and the use of automatic reclosers and slow-burning fuses.

There is a deficit of £24,830 on the Board's revenue account for 1956, mainly owing to increased loan charges. Net loan interest amounted to £837,386, of which £427,453 was charged to capital account. Explaining the Board's policy in this matter, the report says that capitalisation of some interest charges is inevitable and usual in the early years of a single hydro-electric scheme where the load is comparatively small initially but is rapidly growing. The Board has aimed at striking a fair balance between too much capitalisation, which would unduly inflate the capital account for all time, and too little, which would mean higher tariffs for the present generation. The revenue account bears full interest on capital in respect of works deemed to be in commercial use, the balance being capitalised. By the end of 1956 £1,771,000 had been capitalised, £1,019,000 less than is permissible by statute.

Notwithstanding the pressing demands on the Board's revenues, tariffs were maintained at the level to which they were reduced (by about 5 per cent) on 1st January, 1955. Setting the year's deficit against the balance brought forward from 1955, there was a net surplus of £4,371. It is pointed out that higher interest rates have meant an increase of over £120,000 on the total capital.

As regards the future price of electricity, the Board states: "Unceasing efforts will be made to avoid increases in tariffs during 1957, but a great deal will depend on how far inflation, with its attendant rising costs, is kept in check."

Early in 1956, the Government intimated that it desired the Board to make its own arrangements for financing capital outlay and a local issue of £6 million of Uganda Electricity stock was made. The Board also approved the issue of electricity development bonds in order to attract the small local investor.

The Board (chairman, Mr. W. D. D. Fenton, B.Sc., M.I.E.E.) had a staff of 1,790 at the end of 1956, of whom 151 were recruited outside East Africa. The report states that it is the Board's policy to recruit local people, or promote locally-engaged junior employees to fill staff positions of greater responsibility, but the present supply of suitable manpower is inadequate and some overseas recruitment will continue to be necessary. Steps taken in connection with the training of Africans have included the granting of scholarships—two at first—to enable them to attend a United Kingdom university or college and to be given post-graduate works training. Sixteen Africans were receiving instruction at the end of the year under the artisan apprenticeship scheme. Lectures and film shows have been given in order to interest African secondary school pupils in the engineering profession.

Questions on the I.E.E. Regulations

AT a meeting of the Association of Supervising Electrical Engineers on 16th April, with Sir Harold Bishop (president) in the chair, a panel of engineers, having specialised experience, answered questions put by members regarding the 13th edition of the I.E.E. Wiring Regulations. A selection of these replies is given below.

V.i.r. cables in light-gauge conduit using lug-grip fittings, if they were properly installed, were regarded by Mr. C. E. Mills (Fire Officers Committee) as probably better than tough rubber or p.v.c., as enclosure in tubing reduced fire risk. Mr. H. W. Swann (past-president) dissented on the ground that initial low resistance of joints tended to increase. Mr. A. V. Milton (E.C.A.) pointed out that conduits were not so readily interfered with by amateurs.

The reason for dropping, in the 13th edition, the reference to an "earth-free situation" was explained by Mr. Swann as due to its ambiguity and to the diversity in practice in its application to three-point plugs and sockets. Mr. Milton added that often earthed services, e.g. radio, television and telephone, were introduced after completion of an installation, and Mr. E. J. Sutton (National Inspection Council for Electrical Installation Contracting) agreed that an earth-free situation might not remain so. Mr. A. J. L. Whittenham (General Electric Co.) pointed out that the use of portable appliances with long flexes, which enabled them to be carried from earth-free to non-earth-free rooms, was an important factor. In many other countries, however, earthing was not permitted in living rooms and bedrooms.

Regarding the merits of the "all-insulated" method of protecting apparatus (Reg. 401), as opposed to the earthing of exposed metalwork through an earth-continuity conductor connected to a consumer's earth terminal, Mr. Swann recalled that originally it was laid down that if apparatus could be insulated that should be the first line of attack. Earthing was then considered only because so much of the apparatus could not be insulated. Mr. Mills suggested that all-insulation was better (if available in specific cases) in dry situations, although not so mechanically strong as metal.

The permission given in the 12th edition to the omission of a connection to the socket-outlet earth contact in an earth-free situation was intended to lessen danger from bringing an earth into an earth-free situation. This led to difficulties in interpretation and so it was omitted from the 13th edition. Mr. Whittenham emphasised that in no circumstances should the connection to the earth pin of a plug be omitted, in view of the necessity of ensuring earthing of an appliance in a dangerous situation.

Where electricity, gas and water mains could not be completely segregated, Mr. Forbes Jackson said they should be bonded together. He had been unable to find any serious cases of shocks received by men while repairing water-main joints, with which Mr. Swann concurred. Most trouble was due, Mr. Mills suggested, to intermittent contacts.

New City and Guilds Building

The City and Guilds of London Institute has acquired a site for new premises at 76-78, Portland Place, London, W.1, and it is hoped that the new building will be ready for occupation early in 1959. The main building will have seven floors and there will be an extensive basement.

As an indication of the need for more adequate accommodation the Institute states that the number of candidates examined has risen from 74,000 in 1950 to an estimated 125,000 this summer.

VIEWS on the NEWS

By REFLECTOR

SPEAKING at a luncheon last week, Sir Charles Goodeve, director of the Iron and Steel Research Association, referred to the much-publicised numerical superiority of Russian scientists. He suggested that we should offer to exchange our communists for Russian scientists on a one to ten basis. The luncheon was arranged by Chapman & Hall, Ltd., to celebrate the 150th anniversary of the well-known New York publishing firm, John Wiley & Sons, whom they have represented in this country and the Commonwealth for sixty years. The guests included Mr. E. P. Hamilton, president of John Wiley & Sons, and Mr. W. Bradford Wiley, vice-president—grandson of the founder of the firm.

* * *

I am credibly informed that the Electrical Trades Union expects to incur a considerable deficit as a result of the strikes in the shipbuilding and engineering industries although it has made a substantial cut in administration expenses. Annual deficits seem to be chronic for the accounts have not balanced for several years now, with the exception of 1955 when there was a small surplus. It seems as though members will be asked to pay higher subscriptions but in the meantime several of the Union's activities are to be curtailed. The convalescent home at Rustington will be affected as will the work of the "college" at Esher, where selected members are given courses in trade union subjects, with a slightly crimson tinge.

* * *

From the Swindon *Evening Advertiser* I derive this description of some new street lamps installed in the area:

> "They give the impression of malignant Chinese mandarins raising coolie hats by the tips of their long spindly fingers and have a little more personality than the curving wide-jawed monsters which grin down at one from street corners on the rest of the estate."

* * *

The electric fence has become an indispensable adjunct to stockbreeding, but a correspondent says that it is not generally known that Dr. O'Shaughnessy, whose name is famous in India for his projects in telegraph engineering in the days of the East India Company, was the first man to appreciate the value of electricity for the control of animals. While at his home in Ireland in 1857, O'Shaughnessy was testing a telegraph apparatus in a 500 yd long field. He had the wire fixed on poles about 3ft high and as he worked on his tests for over five hours he noticed that a large herd of cattle arrayed themselves in line along the course of the wire and by their touching the wire they caused short circuits and suddenly withdrew. After a time they kept clear of the wire altogether and the Doctor found that when he kept the wire charged all night the cattle were still in bounds in the morning. He wrote of this discovery: "A wire charged with the electric fluid has been proved by me to fence cattle without a paling, fence or ditch. They get a shock when their hair comes in contact with the charged wire and turn right away in disgust." One wonders why this phenomenon should not have been followed up instead of awaiting rediscovery many years after.

* * *

An article in *John Bull* on street-lighting controversies bears the sub-title, "The experts can't agree on how to light Britain after dark. One choice they made turned pretty girls green." While it is true that the merits and drawbacks of the various systems are still the subject of discussion it is unfair to suggest that mercury-vapour lighting is discriminative: it tends to turn plain girls, as well as pretty ones, green. Incidentally, the article attempts to dispose of one argument in favour of good street lighting, in the following terms:—

> "Crime prevention is generally regarded as an important by-product of improved street lighting, but one police force complained that modern lighting installed in its area made officers visible at three hundred yards and gave the criminal a new advantage."

* * *

When commenting on the "lost" turbine wheel at Kikagati, Uganda, in the 26th April issue I should not have said that the loss was experienced by the Uganda Electricity Board. Mr. F. J. Lattin, C.M.G., the London representative of the Board, points out that this small hydro-electric station was purchased only a few months ago. At the time of the incident the plant was owned and operated by the Kagera Mines, who built it in connection with their mining enterprise in south-west Uganda.

* * *

Now that arrangements are being made for next year's exhibition in Brussels it is interesting to find that similar activities were in progress in that city seventy years ago for what was described as the "Great International Competition of Sciences and Industry." According to the *Electrical Review* of 13th May, 1887, there were complaints about the "meagre subsidy of 250,000 francs" offered by the City Council and a lottery was being organised to provide funds. The *Review* noted that for the purposes of competition awards exhibits were not to bear the names of those responsible for them but had to bear a "cipher" and be accompanied by a sealed paper marked with the same cipher and containing the exhibitor's name and address. Upon the whole the *Review* did not like this plan: it said:—

> "This scheme might, perhaps, exclude favouritism, but it would be open to certain objections which have no existence under the present system of open naming. Thus the names of unsuccessful competitors would never become known at all, and public opinion would no longer act as a check upon the juries. At present the technical press can form and give its own opinion upon exhibits, but what would be the use of praising, say, a novel dynamo merely marked in cipher ?"

ENGINEERING WAGES

Court of Inquiry's Recommendations

ALTERNATIVE wage increases, the higher one of which would be conditional upon acceptance of a "standstill" period and reduction of restrictive practices, and the setting up of an impartial body to examine and advise on wage policy are the chief recommendations of the Court of Inquiry into the dispute in the engineering industry. The Court, under the chairmanship of Professor D. T. Jack, C.B.E., was appointed by the Minister of Labour and National Service on 1st April and its report was published last week (H.M. Stationery Office, price 1s 3d). A separate report dealing with the shipbuilding industry makes similar main recommendations.

Giving the background to the dispute between the Engineering and Allied Employers' National Federation and the trade unions affiliated to the Confederation of Shipbuilding and Engineering Unions, the Court notes that the industries affected constitute the largest group in the British manufacturing industries and employ little less than one-seventh of the country's total working population.

Cost of Claim

The claim, submitted by letter dated 17th September, 1956, was for a 10 per cent increase for male manual workers, the existing minimum rates being £8 8s 4d for skilled men and £7 2s 4d for unskilled workers. The employers estimated that the cost of meeting the claim in full would be £70 million a year for federated firms and something in the neighbourhood of £110 million for the whole industry, based on a 44-hour week and not including holiday credits, night shifts, or the possible effects on the wages of maintenance men and engineers in other industries. Strictly limited to adult male employees of federated firms, the cost was put at about £45 million.

In the course of the negotiations the employers made an offer of increases of 6s for skilled, 5s 6d for semi-skilled and 5s for unskilled workers, conditional upon the acceptance of terms regarding a wage "standstill" and other matters. The unions were unable to accept these terms, as they put it, "certainly not on the basis of an offer of a mere 3½ per cent increase."

The Court feels that the main stumbling block was not so much the conditions, though some alterations in the draft would have been necessary, as the amount of the increase offered. Since the present minimum rates were agreed in February, 1956, the index of retail prices had risen by 4 per cent and the Court says it can understand the unions' unwillingness to accept a 3½ per cent increase, having the knowledge that in other industries much less profitable wage increases of 5 per cent had been made. While making this point the Court recognises that a general rise in wages of 5 per cent over the greater part of the economy is out of proportion to the change in the general index of production and that it might well have inflationary implications.

Regarding the conditions suggested, the Court says that the employers were naturally anxious to obtain some protection against the speedy submission of fresh applications. The other terms are considered to be not unreasonable in principle and if acted upon in good faith might make some contribution to the improvement of industrial relations between the parties and of production.

It is therefore suggested that the parties should consider the alternatives of a wage increase of 8s 6d a week in the consolidated time rate for skilled workers or 11s on condition that no further application shall be submitted for a year and that the unions agree to other terms relating to the reduction of restrictive practices and loss of working time. But the Court doubts whether a "period standstill" by itself would be adequate and urges the parties to consider setting up a National Joint Council which might make a periodic review of the industry to cover such matters as changes in the cost of living, changes in productivity, and changes in the economic prospects of the industry with full exchange of information on both sides. This Council, the Court says, should concern itself positively with the productive efficiency of the industry and would make its own contribution to the promotion of that end. The Court also suggests that the parties should give careful consideration to the desirability of including in their agreed procedure for the settlement of disputes a provision whereby unresolved disputes at district or national level should be referred to arbitration.

Referring to the linking of wage movements either in each industry or over the whole field of industry to some measure or measures of productivity, the Court says that unless started from a position of stability the proposal would in its view be doomed to failure.

The wages problem in recent years, it is pointed out, has become an integral part of an inflationary situation which confronts the whole economy. Employers see in the recurring annual demands for wage increases a form of pressure which raises their production costs and which is so general that it cannot be associated with the economic condition of a particular industry. The unions on the other hand feel impelled to press for higher wages to compensate for the upward movement in retail prices and to provide in advance some protection against the further rise which is anticipated. Both sides are anxious that the inflationary process should be terminated but are unable to agree upon the appropriate measures to attain that end.

At the last Court of Inquiry on the engineering industry, in 1954, it was suggested that a valuable contribution to a solution of these wider problems would be the appointment of an impartial body to consider the complex and sometimes conflicting arguments which surround them, and the present Court urges "in the strongest possible terms" that the suggestion should be acted upon. The body to conduct the examination should be a small one with which the Treasury, the British Employers' Confederation, the T.U.C. and the nationalised industries should be associated.

It was subsequently announced that the Government welcomes this recommendation and is already giving it urgent consideration. This will, of course, involve discussions with both sides of industry.

A.E.U. Resolution

A meeting of the 40 affiliated unions of the Confederation of Shipbuilding and Engineering Unions was to be held yesterday (Thursday). At the conference of the National Committee of the Amalgamated Engineering Union at Eastbourne last Monday a resolution was adopted, by 33 votes to 19, instructing the Executive Council to propose that the Confederation's representatives should be authorised to negotiate for an increase of not less than 11s a week, with such modifications of the proposed conditions as could be obtained.

British Industries Fair

SPEAKING at the opening of the British Industries Fair at Castle Bromwich, Birmingham, last Monday, Mr. E. M. Clayson, chairman of the executive committee, said that the exhibits occupied a greater space than at last year's Fair. This was proof that although the Government had withdrawn its financial assistance and closed the London Section of the Fair there was a need for a general exhibition by British industry apart from the specialised exhibitions. The Fair remains open until next Friday, 17th May.

PARLIAMENTARY REPORT

Fuel and Power Debate

Because of the need to build up fuel oil stocks there may have to be a re-phasing of the programme for the conversion of power stations from coal-burning to oil-burning, Mr. Reginald Maudling, Paymaster General, told the House of Commons last week during the debate on fuel and power policy. He said that to meet energy needs the nation must still rely mainly on coal, but by 1965 our present imports of fuel oil would be increased by 50 per cent. He revealed that the Government were trying to find a means of adapting the nuclear source of energy for direct use in industry, instead of applying it solely to the production of electricity.

Opening the debate, Mr. Maudling said that on the basis of an increase in energy consumption of 2 per cent a year, the inland demand would have risen to 300 million tons of coal-equivalent by 1965. Allowing for the production of an extra 20 million tons of coal and about 14 million tons of coal-equivalent from nuclear stations, we should then need about 26 million tons of coal-equivalent in the form of additional oil imports, which meant an increase of over 50 per cent in our present imports. But we must reckon also for changes in the supply and demand factors. A particular difficulty was the increasing proportion of small coal produced in the mines; this might be accentuated because nuclear energy would displace mainly the small, poor quality coal which now went to the electricity stations and this could not, at present, be used easily elsewhere.

The Central Electricity Authority estimated that by 1965 it would be installing 1,850 MW of nuclear plant as against 500 MW of conventional plant. That proportion might change but no one at the moment would be bold enough to predict that by then we should have seen the end of all conventional power stations. The proportion of electricity actually passed into the grid from nuclear sources would be about a quarter by 1965, but by the early 1970s it should have risen to over 40 per cent. At the same time the total demand for electricity would be rising.

"When talking about nuclear power we should not talk of it replacing coal but rather of it releasing coal for other purposes. It is most important to get that across to the country," Mr. Maudling said.

An impartial inquiry into the country's future power programme was advocated by Mr. J. Harvey, who said it was now too big a thing to be developed on a series of parallel and quite separate lines. Power stations and gas works should be integrated units. It was economically crazy to heat power stations with fuel oil which had to be processed in a high-capital-cost refinery. If power stations were not prepared to work on straight crude oils they should have their own simple distillation units producing two fractions, one a long residue which would be burnt at the power station and the other the light ends which would go to the gas works. Power stations should also be the natural producers of chemicals such as sulphuric acid, chlorine and acetylene. Mr. R. Fort considered that the only way of getting a right relationship between electricity, gas, coal and nuclear energy was to allow them to compete on a sensible price basis.

L.E.B. Price Increase Criticised

Commenting on the Minister's statement that he hoped for a reduced cost of electricity, Mr. Gerald Nabarro said he could not have seen the announcement by the London Electricity Board that it would put up its prices by 2s in the £ from 1st June. To what extent was this big increase to cover operating costs, and to what extent was it an effort to create a surplus from which to finance future investment? He agreed with the Londoner who had written to him asking for a committee to be appointed to see if the increase was justified.

Mr. C. R. Hobson shared the concern felt about the L.E.B.'s proposed steep rise in prices which, he said, could not be excused on the ground that there was a price standstill because other Area Boards had not increased their prices by 10 per cent. It was the duty of both sides of the House to have a whole day's debate on the L.E.B.

Mr. J. C. George said that expenditure on power stations and transmission between now and 1965 would be £3,300 million. But nowhere, in any publication, was there an indication that this would produce a reduction in cost.

Mr. Palmer said he would not enter on the merits of the L.E.B. proposal but any fair-minded critic must admit that electricity was sold a little too cheaply in this country. Electricity prices had gone up an average of 30 or 40 per cent over the pre-war prices. Against the general increase of prices that was remarkably small. One effect of public ownership was to keep electricity artificially low because the chairmen of Boards feared too much the unpopularity which came if prices were raised.

Much larger sums must be spent to improve power station efficiency, which was still lower than that in America. He hoped the new Generating Board would give single-minded attention to this. The industry must have special tariffs which would really encourage an improvement in load factor, and it must not be prevented from using promotional advertising with that end in view.

Trolley-bus Conversion

Mr. Geoffrey Wilson, replying to several speakers who had condemned the replacement of trolley-buses by buses, said the change-over had little to do with sources of power; it was purely a matter of convenience in congested areas. The proper economic use of electric power would be on the railways. He and other M.P.s had made an extensive tour of the French nationalised railways and had been much impressed by the electrification being carried out there—much bigger in scale than anything Britain was contemplating.

Steel Production

Mr. Renton, Parliamentary Secretary, Ministry of Power, said that £3 million had so far been lent under the Government's fuel efficiency loan scheme. On the question of steel supplies raised by Mr. Robens, he said that future production targets might have to be revised in the light of the proposed new commitments and the Iron and Steel Board had been asked by the Minister of Power to submit a report on the steel industry's development programme up to 1962. It was in its final draft and would be considered soon.

Contracts had been entered into by the C.E.A. on its own account with the oil companies for the supply of oil to the various power stations which were to be dual-fired. As a result of that policy, announced in 1955, only two completely oil-fired stations were in existence. That policy was continuing to the extent that the contracts must be fulfilled and there was no good reason for changing it.

The Paymaster General, Mr. Maudling, was complimented by many members upon his remarkable Parliamentary performance in speaking for 53 minutes (giving many complicated facts and figures) without having any notes to aid him.

The Metric System

Mr. Albu asked the President of the Board of Trade, in view of the discussions on a European free trade area, what steps he was taking to encourage British manufacturers to offer their goods with dimensions in metric terms, including the international screw thread system.

Mr. F. J. Erroll, Parliamentary Secretary, said the Board of Trade took every opportunity to encourage manufacturers to offer goods which were suitable in all respects to their

overseas customers. There was not at present any universally-accepted international metric system of screw threads and he understood that threads in inch sizes were widely used in certain metric countries.

Commons Nuclear Exhibition

Members of both Houses of Parliament took a keen interest in the exhibition which was staged last week by the Central Electricity Authority in the committee lobby of the House of Commons to explain how nuclear power stations are operated, and to show the artists' drawings of the proposed stations at Bradwell, Berkeley and Hinkley Point.

Engineers-in-Charge

ON Friday last the fifty-second annual dinner of the Institution of Engineers-in-Charge was held at the Connaught Rooms, London, under the chairmanship of Lord Sempill, president of the Institution. A toast to the Institution was proposed by Lord Mills, who said that the United States used nine times the amount of energy that we did, so we had a long way to go. We must not look upon ourselves as a second-rate power, however. We had the ability, skill and enterprise to go far and Lords Mills believed we were on the brink of a second industrial revolution. A good example of our ability was in the field of nuclear power. By 1965 we should have about 6,000 MW of nuclear generating plant, but the advances being made by our engineers might well enable us to exceed this figure substantially.

The toast was seconded by Sir Harold Roxbee Cox and Lord Sempill responded briefly. Mr. L. Copeland Watts proposed a toast to the guests, Mr. G. A. Wilson replying.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £240 10s 0d
Fire Refined 99·70%	ton £239 0s 0d
Fire Refined 99·50%	ton £238 0s 0d
COPPER Tubes ..	lb 2s 3¾d
Sheet	ton —
H.C. wire and strip ..	ton £290 10s 0d
LEAD, English ..	ton £108 15s 0d
Foreign	ton £107 0s 0d
MERCURY	flask £87 0s 0d
TIN, block (English) ..	ton £770 10s 0d
ZINC, G.O.B. Foreign	ton £92 0s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 11½d
Sheet	ton —
Wire	lb 2s 8½d
PHOSPHOR BRONZE Wire	lb 4s 0d
PLATINUM	oz £34 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 26⅝d—26¾d

Nuclear Power Developments

Effect on Electricity Transmission Schemes

THE implementation of the Government's enlarged programme for the building of nuclear power stations will have far reaching effects on the power station construction programmes and the bulk transmission schemes of the Central Electricity Authority. Whereas the earlier plans provided for large-scale generation in the relatively cheap coalfields of the East Midlands from which electricity in bulk would be transmitted to the south and the principal industrial areas of the country, the requirements for nuclear power stations are such that the earlier stations at least will be sited on the southern and south-western coasts.

Considerable re-planning of the national transmission system will therefore be necessary. One of the first effects of this reorientation is the decision of the C.E.A. to suspend, for the time being, the project to build a 275 kV supergrid line from Drakelow power station, near Burton-on-Trent, to the substation which is now being constructed at Fleet, in Hampshire.

The Authority has been in consultation with the planning and local bodies through whose areas the line was to have passed, and these bodies have been advised of the decision, together with the reasons which have led to the change of plan. It is explained that the line was part of the basic plan for meeting the growth in the demand for electricity in Southern England and particularly in the London region. When the plan was formulated, the absence of locally produced fuel in the south and western Home Counties made it economically desirable to locate the power stations required to meet the demand in those areas on sites on or close to the coalfields and to transmit the energy which they produced by overhead lines.

The re-appraisal of the national plan for power in the light of the nuclear power station construction programme means that the need for the transmission of power from the Midland coalfields to the south will not reach a level which will exceed the capacity of the three other 275 kV links between the Midlands and the south for some time to come. Of these links one is already in commission, the second is under construction and the third is due for completion in 1959.

Installation Inspection in Scotland

THE inaugural meeting of the Scottish Committee of the National Inspection Council for Electrical Installation Contracting was held in Edinburgh on 1st May under the chairmanship of Mr. J. Gogan, chief commercial officer, South of Scotland Electricity Board and first chairman of the Scottish Committee. The meeting was also attended by Mr. J. D. D. Shaw, representative of the Electrical Contractors' Association of Scotland on the National Inspection Board, Mr. C. R. King, C.B.E., chairman of the National Inspection Council, Mr. A. F. Plummer, M.C., deputy chairman, Brig. W. G. S. Thompson, O.B.E., chief executive officer and secretary, and Mr. E. J. Sutton, chief technical officer.

The bodies represented were the North of Scotland Hydro-Electric Board, the South of Scotland Electricity Consultative Council, the Electrical Contractors' Association of Scotland, the Scottish Special Housing Association, the Institution of Electrical Engineers, the Association of Supervising Electrical Engineers, the Electrical Power Engineers' Association, the National Farmers' Union of Scotland, the Royal Institution of Chartered Surveyors and the Association of Consulting Engineers.

Mr. C. R. King explained briefly the organisation and objects of the Council and there was a general discussion on the functions of the Scottish Committee. It was reported that, through the co-operation of the Electrical Contractors' Association of Scotland, Mr. James Smellie, the general secretary of that Association, was undertaking the work of secretary to the Scottish Committee.

After the meeting there was a short Press conference, followed by a luncheon at which the guests included the Rt. Hon. Thomas Johnston, C.H., chairman of the North of Scotland Hydro-Electric Board, Mr. J. S. Pickles, chairman of the South of Scotland Electricity Board, Mr. A. A. Fulton, C.B.E., general manager of the North of Scotland Board, and Mr. W. V. Wastie, Ministry of Works.

I.E.A. Exhibition

On Tuesday Mr. F. J. Erroll, M.P., Parliamentary Secretary to the Board of Trade, officially inaugurated the first Instruments, Electronics and Automation Exhibition (see page 868). At a lunch following the opening ceremony, the toast of the "Guests" was proposed by Mr. L. S. Yoxall, chairman of the I.E.A. Exhibition organising committee, who said that all other industries, indeed professions, depended on instruments, electronics and automation. The work of these three industries was shown in all aspects of life: industrial, commercial and domestic. Mr. Erroll briefly responded.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Central Electricity Authority has appointed **Mr. J. L. Ashworth,** A.M.I.E.E., A.M.I.Mech.E., A.R.T.C. (Salford) to be deputy divisional controller of the North West, Merseyside and North Wales Division. Educated at the Stockport Grammar School and the Royal College of Technology, Salford, Mr. Ashworth served his apprenticeship with Mirrlees, Bickerton & Day, Ltd., of Stockport, followed by a short period in the Test and Sales Department of the Metropolitan-Vickers Electrical Co., Ltd. After various positions with Metropolitan-Vickers he joined the Manchester Corporation at the Stuart Street power station and later served with the Hull Corporation Electricity Department with whom he was assistant charge engineer and technical assistant in the Construction Department. After a period as maintenance engineer with the Halifax Corporation, he joined the Mersey Power Co., Ltd., as engineer in charge of their plant construction. He was subsequently appointed station superintendent of both the company's stations and later became generation engineer for the company. On the reorganisation of the industry in 1948 Mr. Ashworth was appointed chief generation engineer (operation) of the North Western Division, and when that Division amalgamated with the Merseyside and North Wales Division in 1954 he was appointed chief generation engineer (operation) of the new Division.

Mr. J. L. Ashworth

Mr. A. S. Dodd has been appointed a director of John Thompson Water Tube Boilers, Ltd., and London manager of John Thompson, Ltd. He succeeds **Mr. C. J. Howard,** who was recently appointed managing director of John Thompson Water Tube Boilers, Ltd.

Mr. Dodd joined John Thompson at Wolverhampton five years ago from Merz & McLellan, with whom he was senior engineer at Newcastle-on-Tyne.

Mr. A. S. Dodd

Mr. J. Boyd

At the company's Belfast branch, **Mr. J. Boyd** has been appointed area manager, to represent all of the John Thompson Group companies in Northern Ireland and Eire. In the latter territory, in respect of John Thompson Wilson Boilers, Ltd., he will co-operate with the agents, William Peat & Co., Dublin. He will open a new area office for John Thompson, at 26, Wellington Place, Belfast. Mr. Boyd, who has been with John Thompson for seven years, was previously assistant manager at the company's Glasgow office.

Mr. L. C. Bingham, sales director of the Venner group of companies, left this week by air on a business trip to Italy and Africa. During his tour Mr. Bingham will visit Rome and Milan where he will investigate the possibilities of setting up manufacturing facilities for Venner products.

Mr. H. E. Levy, B.Sc.(Eng.), A.M.I.E.E., has been appointed chief engineer of Foster Transformers, Ltd., South Wimbledon, S.W.19. On leaving London University with an honours degree, Mr. Levy obtained practical experience with Brentford Transformers, Ltd., specialising in voltage regulator development. After serving in all the technical departments he was made chief electrical engineer. Mr. Levy joined Foster Transformers in August, 1955.

Mr. H. E. Levy

Simmonds Aerocessories, Ltd., of Treforest, Glamorgan, announces the following additions and appointments to its board as executive directors:—Mr. G. E. Bache (executive director and general manager); Mr. S. H. Goss (general sales manager); Mr. C. J. Williams (works manager); Mr. P. Pehrson (export sales manager); Mr. A. Beard (production adviser and methods engineer); Mr. J. Burnell (chief mechanical engineer).

Mr. J. E. Peters, B.Sc.Tech., M.I.E.E., has been appointed to succeed **Mr. H. G. Bell,** M.Sc.Tech., M.I.E.E., as chief engineer to the North Western Electricity Board with effect from 1st September next.

Mr. Peters was educated at the William Hulme Grammar School, Manchester, and Manchester College of Science and Technology, where he obtained his degree of B.Sc.Tech., with first-class honours in electrical engineering. He served a two-year college apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd., Manchester, and entered the electricity supply industry in 1932 when he joined the Central Electricity Board in Manchester. He took a leading part in the testing and commissioning of the 132 kV grid system in the North West and, in 1946, became area technical engineer. On nationalisation, Mr. Peters was appointed as assistant chief engineer (planning and development) to the North Western Electricity Board. He has attended the Administrative Staff College, Henley-on-Thames, and has served on various I.E.E. Committees.

Mr. J. E. Peters

Mr. H. G. Bell

Mr. Bell, who retires at the beginning of September, has been chief engineer to the Board since February, 1954. He was educated at Manchester Central High School, Manchester College of Science and Technology and Manchester University. He served as a signals officer during the 1914-18 war and later was seconded to the Admiralty for anti-submarine research work. In 1919 he joined the British Westinghouse Co. (Metropolitan-Vickers), his various positions including that of liaison officer in America. Whilst still with Metropolitan-Vickers in 1922 he ran the first B.B.C. north western transmitter "2 ZY" which then operated from Trafford Park. In 1930 he joined the Central Electricity Board as chief technical engineer for the North West, leaving in 1946 to become chief engineer and manager with the former Stretford undertaking. On nationalisation he was appointed manager of the North Western Board's Manchester Sub-Area, and became chief engineer in December, 1953.

Mr. G. M. Stephens, A.M.I.E.E., chief labour officer of the Midlands Electricity Board, has been seconded for a three months' tour of duty with the Electricity Corporation of Nigeria,

to work under the general manager in establishing a Personnel Department. He left for Lagos this week by air.

Mr. F. French, sales manager of the Sloan Electrical Co., Ltd., has been appointed general manager of the company in succession to **Mr. E. H. Maltby** who resigned the position on being appointed joint managing director of Edmundsons Electric Co., Ltd. Mr. F. French has also been appointed to the board of the Sloan Electrical Co. He joined the company in 1926 at its Bristol branch and subsequently held the position of assistant manager at Glasgow and later at Manchester. In 1938 he was appointed manager of the Accessories Department in London, in 1950 assistant sales manager and in 1951 sales manager. The Sloan Electrical Co., Ltd., is a subsidiary of Edmundsons Electric Co., Ltd.

Mr. F. French

Mr. F. C. Morris, M.I.Ex., manager of the Export Department of Johnson & Phillips, Ltd., has retired after thirty-five years' service, and he has been presented with two winged armchairs by the directors of the company. Departmental managers have presented him with an oak rug chest and his staff subscribed for an electric convection heater.

Mr. F. C. Morris

Mr. Morris was educated at the City of London School and joined the Western Electric Co., where he remained until the outbreak of the 1914-18 war. He served throughout the hostilities in the Royal Field Artillery. In 1919 he joined Johnson & Phillips, Ltd., as an assistant in the General and Export Sales Department. Later he helped to form the Export Department of which he became manager in 1944. Mr. Morris saw much of the growth of the J. & P. overseas organisation and helped materially in the establishment of the branches at Sydney, Melbourne, Johannesburg, Bombay and Karachi.

At the annual dinner of the Faraday House Old Students' Association, held at the Savoy Hotel last year, the Principal of **Faraday House Engineering College,** Dr. W. R. C. Coode-Adams, announced the establishment of a new series of scholarships to be known as the Alexander Russell Scholarships in memory of a former Principal, Dr. Alexander Russell, F.R.S. These scholarships cover all the tuition fees of a student throughout his entire period of training at the College, and are in addition to the Faraday Scholarship (£200) and the Maxwell Scholarship (£100). The following is a list of the successful candidates in the 1957 examinations:—Alexander Russell Scholarships: Messrs. B. W. Estlin (Kent College, Canterbury), D. G. Clarke (Cheltenham College) and C. M. Leech (St. Brendan's College, Bristol). Faraday Scholarship: Mr. C. J. V. Smith (Bedales School). Maxwell Scholarship: Mr. R. Emmerson (Welwyn Grammar School).

Kelvin & Hughes (Industrial), Ltd., has appointed **Mr. J. R. Taylor** as area engineer for the West of England. He has served eighteen years with the company, the last two as area engineer in South Wales. His new address will be "Garth," Edward Road, Walton St. Mary, Clevedon, Somerset (telephone: Clevedon 3535).

The **Diesel Engineers' and Users' Association** held a luncheon on 2nd May at the Connaught Rooms, London, the principal guest being Mr. J. H. Pitchford, managing director of Ricardo & Co., Ltd.

Mr. K. H. Tuson, president of the Association, welcomed the guests and reviewed the activities of the Association over the past year. He announced that the Committee had awarded the medal for the most outstanding paper to Mr. D. S. Tritton.

Mr. W. A. J. Sayer, until recently assistant general manager of the machinery division of George Cohen Sons & Co., Ltd., has been appointed managing director of George Cohen Sons & Co. (South Africa) (Proprietary), Ltd., Johannesburg, and will shortly take up residence in South Africa.

Mr. D. G. Ashton Davies has been appointed sales manager of British Physical Laboratories, Radlett, and of B.P.L. (Instruments), Ltd. He was formerly with Mullard and Marconi Instruments, Ltd.

A dinner was recently held at the Waldorf Hotel, Cooper Street, Manchester, in honour of **Mr. E. Wilmot** on his retirement from the Manchester branch of Falk, Stadelmann & Co., Ltd., after forty-nine years' service with the company. The whole of the staff of the Liverpool and Manchester branches were present, and Mr. C. J. Falk (sales director), Mr. E. V. Brown (director from Leeds), Mr. R. A. Stenning (branch manager, Birmingham) and Mr. J. E. Rhind also attended. Mr. Falk proposed the toast to Mr. Wilmot and subsequently Mr. H. Sawtell presented him, on behalf of the staff, with a two-speed lawn mower and two deck chairs. Mr. Wilmot became manager of the Manchester branch and a director of the company in 1949.

Mr. E. Wilmot

The board has appointed **Mr. H. Punter** to succeed Mr. Wilmot. Mr. Punter joined the company in 1933 and became a technical representative until he was transferred to head office in 1949, when he was promoted to manager of the Technical Department. He was appointed a local director in 1952.

Col. G. W. Raby, deputy director (engineering) of the Atomic Energy Research Group at Harwell, is taking up the position of managing director of Atomic Power Constructions, Ltd., on 1st July. His services in a consultative capacity will be available to the United Kingdom Atomic Energy Authority for an extended period. Atomic Power Constructions is the group which includes representation of Crompton Parkinson, Richardsons Westgarth and International Combustion (Holdings).

Mr. E. S. Waddington, F.S.E., M.Inst.W., manager of the industrial division of Philips Electrical, Ltd., since 1933, retired on 30th April. Mr. Waddington has been closely connected with numerous trade associations and professional bodies, being a founder member of the Institute of Sheet Metal Engineering, a member of the Council and vice-chairman of the Finance Committee of the Institute of Welding, and a British founder-delegate of Commission No. 8 of the International Institute. He is also a member of several B.S.I. Committees. A member of the Society of Engineers for many years, Mr. Waddington served as president in 1948-49 and is at present hon. treasurer. He was one of the founders of a number of B.E.A.M.A. sections and is a past member of the Council; he is vice-chairman of the Arc Welding Plant Section and serves on several technical committees. Mr. Waddington is starting in practice as a consultant at 9, Thurleigh Avenue, London, S.W.12 (telephone: Battersea 7659).

Mr. E. S. Waddington

The Southern Areas Electric Corporation, Ltd., announces that **Mr. A. W. Field,** B.Sc., A.M.I.Mech.E., has joined the board of its subsidiary, Mawdsley's, Ltd., of which company he is at present general works manager.

Mr. J. P. Coleman, M.I.E.E., and **Mr. J. W. Perkins,** of Gresham Transformers, Ltd., left last week on the *Queen Elizabeth* for Canada, where

they have planned an 8-week tour to set up an organisation which will handle the growing volume of orders which the company has obtained in Canada. In addition to Gresham Transformer business they are also looking after the interests of Lion Electronic Developments, Ltd., and the Data Recording Instrument Co., Ltd.

Mr. R. G. Flanagan has joined the Jackson Electric Stove Co., Ltd., as branch manager at its Newcastle office. He will be responsible for all the company's sales in the area covered by the North Eastern Electricity Board. Mr. Flanagan started his career in the works of the Hotpoint Electric Appliance Co., Ltd., and was later a representative for Creda, and a special representative for Carron Company.

Mr. R. G. Flanagan

Major E. H. W. Banner, T.D., M.Sc., M.I.E.E., was married on 1st May to Mrs. C. V. Forrest, widow of Mr. B. A. Forrest who was a director of the S.D. Syndicate, Ltd. Major and Mrs. Banner are taking part in a visit which Major Banner is organising to the 1914-18 war areas in Gallipoli and Macedonia, taking in other places of interest. The tour begins on 25th May.

Sir William Darling, C.B.E., M.C., D.L., LL.D., Conservative Member of Parliament for South Edinburgh, has resigned his seat; he was first elected to Parliament in 1945. Sir William, who is 71, is chairman of Bruce Peebles & Co., Ltd., and a former Lord Provost of Edinburgh.

Mr. D. C. Rogerson has been appointed deputy publicity manager of the General Electric Co., Ltd., responsible for the company's publicity on heavy engineering and atomic energy. This is an additional appointment to that of Mr. A. Clarkson who continues as deputy publicity manager, an appointment which he has held since 1938. Mr. Rogerson has been with the company for thirty years, the first eighteen of which were spent in the Publicity Department of the company's Witton Engineering Works at Birmingham. For the last twelve years he has been chief Press officer of the company.

Mr. D. C. Rogerson

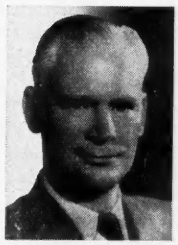
The annual Parents' Day of the London Division of the **Central Electricity Authority** was held on Friday last, when apprentices at the Bankside Training School had the opportunity of taking their parents and friends around the workshops of the school to inspect some of the metalwork carried out by them during the year. Following the inspection the apprentices and their visitors proceeded to the Institution of Electrical Engineers, where Lady Eccles presented the apprentices' prizes. Mr. H. V. Pugh, divisional controller, presided, and Mr. G. W. Whitmell, the apprentices' training instructor, presented his report on the progress made during the year. This was followed by an encouraging address to the boys by Sir Josiah Eccles, who urged them to concentrate on the job in hand, with an eye on the immediate one ahead, rather than to try to look too far into the future, and in carrying out their job to do just that little more without any thought of immediate reward.

The annual general meeting of the **Exeter Electric Club** was held at the Imperial Hotel on 26th April. The retiring president, Mr. P. Tracey, as his concluding official duty, handed to Mr. Dobson, the local Electrical Industries Benevolent Association treasurer, a cheque for £10 10s from the Club funds. The hon. treasurer of the Club, Mr. J. Rothera, was presented with a picnic set and the hon. secretary, Mr. A. W. Hicks, with a fishing reel and line in appreciation of their services. The following officers were elected:—President, Mr. W. Hallam; vice-president, Mr. D. Rupp; hon. secretary, Mr. A. W. Hicks; and hon. treasurer, Mr. J. Rothera. Mr. Rupp was presented with the "Peters Cup" for being the winner of the annual treasure hunt.

The British Thomson-Houston Co., Ltd., which has for some years awarded engineering research fellowships to selected graduate apprentices, has awarded fellowships for 1957 to the following:—**Mr. A. J. Baden-Fuller,** who graduated at Cambridge University with first class honours. His research will be concerned with the application of ferrites in radar control. **Mr. D. H. Hopewell,** who graduated at Oxford University with first class honours. He will investigate the problems raised by the use of induction motors in servo-systems. **Mr. T. J. Roberts,** who graduated at Nottingham University with first class honours. His research will be concerned with heat flow problems in large electrical machines.

Two B.I.C.C. teams (Prescot and Belvedere) won their way to last Saturday's C.M.A. cup final at the Southern United Telephone Cables' Dagenham sports ground, which was won by the Belvedere team by 5 goals to 3. After the match both teams were entertained to a dinner given by the C.M.A. at Lyons' Corner House, Coventry Street. At the dinner Mr. R. W. C. Reeves (director, Johnson & Phillips), who is president of the C.M.A. cup competition for this year, presented awards to the teams. Many distinguished executives attended the dinner, among whom were Sir John Dalton (chairman of W. T. Henley's) and Mr. F. Waine (director of B.I.C.C.).

Mr. C. Bottrell, A.M.I.E.E., A.C.T.C.(Birm.), who writes in this issue on economies in power station buildings (page 849), received his technical education at the Birmingham Central Technical College and was trained in the former Birmingham Electric Supply Department, becoming technical assistant in 1937. Three years later he joined the former Central Electricity Board (Central England Area) as assistant engineer (operations) and in 1945 he went to the C.E.B. headquarters as assistant engineer (power station development). Mr. Bottrell was made senior assistant engineer (generation design branch) with the British Electricity Authority in 1948 and station design and layout engineer in 1950. He has now taken up the post of chief engineer of the General Engineering and Projects Department of the English Electric Co., Ltd.



Mr. C. Bottrell

Mr. F. W. Perks (E.M.I.) has been elected chairman of the British Radio Equipment Manufacturers' Association. The vice-chairman is **Mr. A. L. Sutherland** (Philips Electrical).

OBITUARY

Dr. G. E. Foxwell.—The death occurred on 26th April, at the age of sixty-four, of Mr. Geoffrey Edwin Foxwell, C.B.E., D.Sc., F.Inst.P., F.Inst.F. Dr. Foxwell was a member of the Fuel Efficiency Advisory Committee set up by the Minister of Fuel and Power. He was hon. secretary and a past-president of the Institute of Fuel.

Mr. A. V. Summers, chairman of Milliwatt, Ltd., died on 1st April whilst abroad in Rio de Janeiro.

Mr. Walter Geddes, late works engineer of W. T. Glover & Co., Ltd., Trafford Park, died on 2nd May at the age of seventy-four.

Mr. A. C. Borthwick, A.M.I.E.E., died suddenly on 18th April. He had for many years been the Scottish agent for E. N. Bray, Ltd., and was about to retire from this position.

Mr. A. Fitzsimmons, A.M.I.E.E., whose death we reported in last week's issue, was labour superintendent and chief rate fixer with the Micanite & Insulators Co., Ltd. Before joining the company in 1930 he was for eighteen years with the Metropolitan-Vickers Electrical Co., Ltd.

DEVELOPMENT IN 1956

E.D.A.'S THIRTY-SEVENTH ANNUAL REPORT AND MEETING

IN its report for the year ended 31st December last (the thirty-seventh) the Council of the British Electrical Development Association mentions that five new overseas contributors were enrolled, three Australian, one Dutch and one Belgian.

Through its editorial Press services the Association was successful in gaining a considerable amount of space for electrical development in the national and provincial newspapers, technical and trade journals and many periodicals. The Association was again responsible for the Press publicity for the British Electrical Power Convention and secured a greater "coverage" than ever before. Contact was maintained with the public relations sections of many Government Departments.

Press advertising campaigns carried out during the year were domestic and general, industrial, agricultural and horticultural, and municipal and educational. Assistance was given to members in the preparation of local publicity schemes. A variety of publications was again produced, including agricultural and horticultural booklets and new film and filmstrip catalogues.

New Films

Four new films were completed during the year and a number of others were being proceeded with. Over 15,000 copies of films were issued on loan by the Film Library and many others were distributed by other organisations. In addition, 253 copies of films were purchased by members. New photographs added to the Photograph Library numbered 1,250 and 1,065 photographs were lent to Electricity Boards, local authorities and others. Many lantern slides and filmstrips were lent or sold.

Displays were designed and organised for 24 national exhibitions and shows, as well as for the British Electrical Power Convention, and Electricity Boards were helped with display material and advice in arranging local exhibitions. The report gives brief details of E.D.A. displays at a number of exhibitions and agricultural shows.

The work of the Rural Electrification Advisory Committee is reviewed. The Technical and General Sub-Committee, it is said, was actively concerned in the preparation of publications and the initial work on four new agricultural films. It also considered, with the main Committee, the future policy in relation to farm electrification training courses. The second residential Rural Electrification Conference held at the Nottingham University School of Agriculture was attended by 110 people and is reported to have been even more successful than the first one. A farm electrification course, held at the Lackham School of Agriculture, Chippenham, was attended by 43 students.

Further inquiries were attracted by the Association's advertisements in the trade and technical Press drawing attention to the value of electric heat, electronic control, improved materials handling and other means of increasing productivity. Other industrial activities included the loan of films and specialist lectures.

Under the heading "Commercial Development" the subjects dealt with include electrical data for architects, heating of buildings, recommended electrical appliances, house insulation, British Standards, the design and operation of cooker boiling plates, water heating and laundry equipment, commercial catering, street lighting and electric traction.

Testing House activities during the year included the examination of 256 appliances—an increase of 23. There was an increase from 25 to 39 in the number submitted for certification for compliance with standard specifications but the number examined for the E.D.A./B.S.I. Advisory Committee on Electrical Appliances and Accessories fell further to only 19. The "Kite Mark" scheme for electric blankets resulted in a considerable increase in the amount of work undertaken for the British Standards Institution; forty appliances were examined. In addition, work was done for various E.D.A. and B.S.I. committees.

Of the appliances examined, out of 100 recent cases 28 were found to be entirely satisfactory, 37 exhibited major faults and 35, while not dangerous or entirely unsatisfactory, were the subjects of suggestions for improvement.

The E.D.A./B.S.I. Advisory Committee continued to give advice to manufacturers. Among a wide variety of new appliances considered were an industrial iron, a stripper-scraper, a sump heater, a time controller, a razor adaptor, a soil warming set, a cultivator and a chick rearer. Objection was taken to a number of electric blanket "kits" on the ground that the home construction of these appliances was hazardous. In connection with the design of portable gardening appliances the use of 110 V from a double-wound transformers, with earthed mid-point of the secondary, was strongly recommended.

Educational activities included the nineteenth annual conference, the annual conference of electrical housecraft advisers and senior demonstrators, the public speaking conference, salesmanship talks to Electricity Boards' staffs, the salesmanship training course and assistance to schools and institutions.

Contact was maintained by the Association with over sixty organisations a list of which is given in the report.

An appendix dealing with the work of the Electric Vehicle Association of Great Britain notes the increasing interest in battery-electric vehicles, stimulated by the oil supply situation. It is stated that the lack of appreciation of the dangerous position arising from our too-great dependence on overseas oil has restricted the growth of the electric vehicle industry whose resources are now strained to the utmost in dealing with the demand that has arisen.

The activities of the Electrical Association for Women are dealt with in a second appendix.

Annual Luncheon

The annual luncheon of the Association took place at the Savoy Hotel, London, on Tuesday last, and well over 500 members and their guests were in attendance. The toast "Electrical Development" was proposed by Lord Mills, Minister of Power, who said that although the E.D.A. was about 30 years old it acted as a young institution, this latter fact being emphasised by the leading part which it had taken in the recent Schoolboys' Own Exhibition. He said that he was very appreciative of all that the Association did in promoting the use of electricity

Mr. J. I. Bernard, director and secretary, with Lord Mills and Viscount Chandos

in this country. The standard of living in any country could be measured by the amount of electricity which was used and in this country the demand was growing year by year with increasing momentum. If our standard of life was to advance and our industry to make progress relative to other countries, we must have cheap and abundant electricity. The secret of advancement was power and we were on the brink of great developments in this direction.

In 1955 a programme of power developments was announced and now, only two years later, the target figures had been trebled. The United Kingdom Atomic Energy Authority had given us confidence to believe that we could produce electricity at a reducing cost until the price would be less than that for energy from conventional coal- and oil-fired power stations. Another aspect of the costs of power was the threat to the amenities of our countryside. Everybody wanted electricity but would everybody be prepared to see a pylon or a nuclear power station in his back garden? Despite this, however, the expansion of our power programme must go on if industry was to be competitive with that in other countries. The supply of electricity must match the demand above all other considerations. The amount of time spent in inquiries regarding the siting of power stations and transmission lines was appalling. Although courtesy and restraint must be exercised we must not fail to produce the amount of power required by the nation. In conclusion, Lord Mills suggested that E.D.A. could broaden its obligation to teach people that they must have power stations and transmission lines if they wanted more electricity.

The response was made by Viscount Chandos, president of the Association, who also proposed a toast to the guests. He said that the electricity industry was now, for the first time, the principal exporting industry in the United Kingdom. Recent developments had made it possible to produce electricity in conventional power stations much more cheaply. Increases in the size of boilers and turbo-alternators had resulted in a big increase in operational efficiencies. After briefly reviewing some of the more recent and striking advances which had been made in electrical engineering Lord Chandos turned to nuclear energy. He said that the Calder Hall type of reactor would undoubtedly lead the world for some time. Despite this, however, he said that British engineers and scientists would not be slow in developing more advanced types of reactors for power generation.

DD

The response was made by Lt.-Col. Lord Dudley Gordon, who said that E.D.A. was fortunate in having a president who was so successful in many spheres of activity. The Association stood midway between research and development and production. Industries which took full advantage of electricity proved that this was an excellent way of reducing costs. This had in fact been done in the steel industry. As regards nuclear power, he had said in his paper to the British Association three years ago that he was looking forward to the development of a breeder reactor. Before his paper was read he had had to insert a footnote saying that this was now almost an accomplishment. In conclusion, Lord Dudley Gordon said that he looked forward to the direct generation of electricity from nuclear energy without the interposition of steam boilers and turbines.

Annual Meeting

Before the ensuing annual meeting the chairman, Mr. Denis Bellamy, presented Mr. Victor Dale, the retiring director and secretary, with a cheque and a book in which were inscribed the names of the contributors. He did this in a felicitous speech wishing Mr. Dale good health and enjoyment in his leisure. He also presented a bouquet to Mrs. Dale. Mr. J. O. Knowles, chairman of the B.E.A.M.A. Council, and Miss Vera Norvick, assistant secretary, Electrical Association for Women, supported Mr. Bellamy. In the course of his acknowledgment Mr. Dale said that he would like to think that eventually E.D.A. would become a power in the future European organisation. He was thankful that he had been given a job which had brought happiness to so many people.

At the annual meeting the report and accounts were formally adopted and the chairman announced that Viscount Chandos had consented to serve as president for a third year. Mr. C. R. King, seconded by Mr. W. S. Lewis, proposed a vote of thanks to Lord Chandos.

Mr. W. S. Lewis, the new chairman of the E.D.A. Council

The chairman reported the appointment as a vice-president for the three years 1957-60 of Sir Josiah Eccles, C.B.E., and the reappointment as vice-presidents for the same period of Lord Beveridge and Capt. J. M. Donaldson.

Mr. L. Howles moved a vote of thanks to the chairman, which Mr. W. N. C. Clinch seconded, and after a brief reply by Mr. Bellamy, Mr. J. Mould, seconded by Mr. N. F. Marsh, thanked the chairmen, vice-chairmen and members of all E.D.A. committees and the technical Press.

At the conclusion of the proceedings Mr. W. Gilchrist extended a welcome to the new director and secretary, Mr. J. I. Bernard.

At a subsequent meeting of the Council, Mr. W. S. Lewis was elected chairman and Mr. W. N. C. Clinch vice-chairman.

Euratom Nuclear Programme

A PROGRAMME of construction that would give the six Euratom powers—Belgium, France, Germany, Italy, Luxembourg and the Netherlands—15,000 MW of nuclear power plant by 1967 is recommended in a report published on Tuesday. The recommendation is made by M. Louis Armand (France), Herr Franz Etzel (Germany) and Professor Francesco Giordani (Italy) who in their report emphasise the amount of help which the United States, Great Britain and Canada are ready to offer Euratom.

INSTRUMENTS, ELECTRONICS AND AUTOMATION

REVIEW OF THE EXHIBITION AT OLYMPIA

THE Instruments, Electronics and Automation Exhibition now being held in London at Olympia (7th to 17th May) is the first of its kind independently organised to represent all the firms directly engaged in this field. The latest applications of the entire range of electronic equipment are on view together with the related components, materials and services employed. A special feature is a display of the more important items of equipment in actual operation. The exhibition was opened on Tuesday by Mr. F. J. Erroll, Parliamentary Secretary to the Board of Trade (shown above).

In conjunction with the exhibition conferences and lectures are taking place; the programme was given in last week's *Electrical Review*.

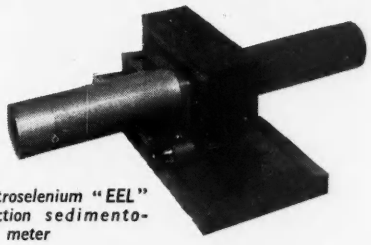
A first impression of the exhibition gives an idea of the enormous variety and scope of the new instruments which the electronic age has called into being. Amongst the completely new equipment shown by the British Thomson-Houston Co. is an electronic device for vibration analysis and the balancing of machines of all sizes and shaft speeds from 100 to 30,000 r.p.m., together with a portable direct reading vibration meter for use over a wide range of frequency and amplitude, the principal components being indicated both as meter readings and, visibly, on an oscilloscope. Also new is the direct reading optical tachometer. In this field Smiths Industrial Instruments are showing their new heavy duty tachometer generator for the remote indication of rotational speeds which has been specially developed for arduous duty over a wide range of speed in rail traction, marine service and heavy industry. A new calibrated relay, with an accuracy of $\pm$ 1 per cent under static conditions, can also be seen, high contact pressure ensuring that the accuracy of setting is unaffected by the wear of the contacts.

Among the instruments exhibited by E.M.I. Electronics is a range of measuring oscilloscopes, waveform analysers and a display of microwave equipment. Included also are a dynamic balancing machine, a range of stroboscopes and a vibration generator for testing purposes. Stroboscopes for many different applications under greatly varying conditions also figure in the exhibit of Ernest Turner Electrical Instruments which includes electrical measuring instruments of both waterproof and hermetically-sealed types. The new " Strobolyser " B55 by Savage & Parsons has been designed greatly to extend the scope and accuracy of the standard type of stroboscope. Remote handling equipment also forms part of this display, in which particular attention is directed towards a range of what are claimed to be the most accurate remote reading resistance thermometers commercially available.

Vibration being an ever-present problem, it is noteworthy that Dawe Instruments are showing a vibration indicator, employing subminiature valves and components, sufficiently small to be held in the hand and weighing

only 2½ lb. Vibration, however, is exploited to good purpose in the "Visigauge," or thickness meter, which measures the thickness of material by determining the fundamental natural frequency of vibration in the direction of thickness which is indicated directly on the calibrated scale of a 21in cathode ray tube.

Among a number of new instruments seen on the stand of Muirhead & Co. is a synchro test equipment for testing servo-motors on a quantity basis to an accuracy usually associated only with laboratory measurements. A low frequency phasemeter and a general purpose low frequency analyser are also shown. A. E. Cawkell Electronic Engineers also have much to show that is new including a sound level meter, a pulse generator and a stabilised power supply comparator and tester for measuring the very small



Evans Electroselenium "EEL" photo-extinction sedimento-meter

voltage changes which occur in stabilised power supplies when the load and/or the mains voltage are changed.

An extensive range of equipment for measuring temperature, mainly by electrical means, covering the entire field from sub-zero up to the highest temperatures encountered in industry or research, is shown by Foster Instruments Co., Ltd. All these instruments are seen as single and multi-station indicators and recorders. The optical pyrometers exhibited cover a range of 700 to 3,000 deg C. Included also is a new range of surface contact pyrometers, foundry pyrometers and smoke detection equipment. Of particular interest are the "Introscopes" for internal inspection of hollow parts, tubes, etc., not normally accessible for inspection.

The many diverse applications of photo-electric devices are well represented at the exhibiton. Evans Electroselenium are showing a complete range of instruments which include blood cell counters, fluorescent-light meters for the measurement of bleaches, fluorimeters to evaluate adrenaline and vitamin assays and photo-extinction sedimentometers for determining the size characteristics of fine powders. Radiovisor Parent, Ltd., are also demonstrating a variety of photo-electric equipment for the detection and control of smoke, flame failure in gas and oil burning plants, and the control of artificial lighting. Some important industrial uses of automatic control through photo-electric and electronic relays are exemplified in liquid level control, precise adjustment of conveyors and in the operation of press ejection monitors protecting the tools of power presses working automatically from a roll feed. Other applications include packaging, event recording, turbidity measurement and burglar and fire alarms.

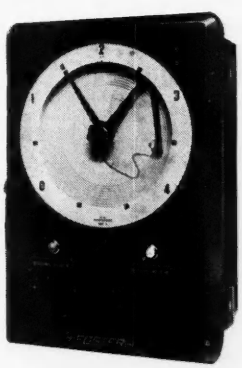
A number of completely new electronic control units operated photo-electrically are introduced by Elcontrol, Ltd. Even within limited viewing space a high degree of discrimination can be achieved as, for example, in industry where the equipment may be required to check the presence of a workpiece before a multiple press is operated, or equally to check the presence of a tool or detect a damaged one.

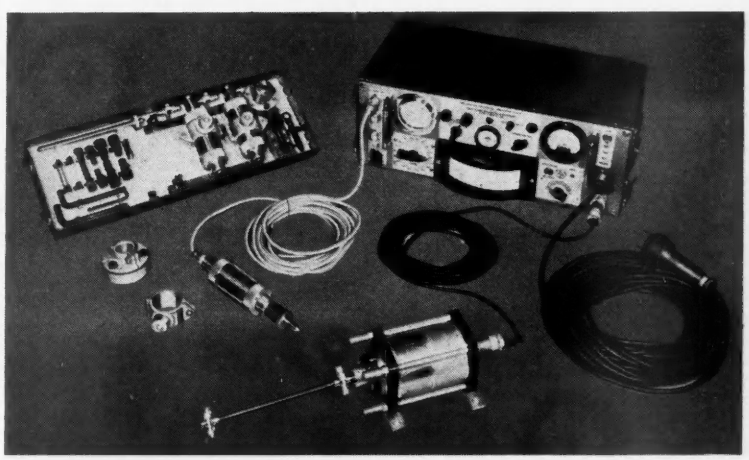
Among the apparatus exhibited by Electronic Instruments, Ltd., is an industrial pH meter which records the reading of six independent electrode systems through an automatic switching unit which selects each electrode in turn. The output of the pH meter is taken up to an electro-pneumatic convertor which enables conventional pneumatic recorders and controllers to be used to provide a complete system of automatic process control. An important section of the stand is devoted to the family of instruments which is being developed around the E.I.L. "Vibron" vibrating condenser unit. This device replaces the electrometer valve in the measurement of very small currents. The Southern Instruments Oscillograph Division is showing a new type of cathode-ray oscillograph which has been developed to provide a multi-channel recording equipment of great flexibility.

A range of tank contents gauges suitable for installations ranging from bulk storage tanks to small road tankers are being shown by Simmonds Aerocessories, Ltd. Their liquid flowmeter is automatically corrected for variation of specific gravity and the equipment includes meters that indicate "rate of flow" and "pounds left or gone."

Cinema-Television, Ltd., have on view an interesting selection of instruments for measuring both capacitance and inductance, as well as their flying-spot particle resolver which will produce on a television type screen a high quality picture of any object presented to it on a standard microscope slide.

A glass-reinforced plastic caravan fitted out as a mobile test shop for use on sites for testing and calibrating control instruments before commissioning is the main feature on Costain-John Brown's Instrumentation Division stand.





Above: Foster electronic smoke density indicator recorder
Right: B.T.H. "Rotabalance" electronic balancing equipment

The exhibits of Evershed & Vignoles, Ltd., demonstrate applications of electronic instrumentation and control to various industries. Among the items are differential transmitting flow meters, a range of transmitters for pressure, temperature, level, interface and specific gravity; and a variety of electro-pneumatic and electro-hydraulic positioners. A typical control desk operates in conjunction with hydraulic positioners and a control cubicle containing rack-mounted three-term electronic process controllers and power unit.

Included in their range of testing equipment, Microcell, Ltd., have on view a transistor measuring set, Type 107, which has been developed as a laboratory instrument capable of giving full information on the characteristics of p.n.p. and n.p.n. transistors. Collector and base direct currents are separately metered and continuously variable over a wide range.

A comprehensive range of testing and recording instruments is on view at the stand of Nash & Thompson, Ltd. Included among them is an instrument for detecting short-circuited turns in coils and transformer windings, soil resistance meters, a vapour pressure recorder and a sensitive stable low noise chopper type amplifier. The company are also displaying network calculators and a number of other useful instruments.

Recording and Control Equipment

It has often been said that science depends primarily on measurement, subsequently processed in the form of data. This contention is certainly substantiated by the amount of recording equipment which is exhibited. Potentiometric recorders figure largely in many displays, Philips Electrical showing a range of such instruments for automatically recording temperature, monitoring vibration in power station turbines and, in conjunction with weighing equipment, operating with strain gauges as electro-mechanical transducers.

A considerable number of panel-mounted working models of their instruments are exhibited by Integra, Leeds & Northrup, Ltd., in which are included the new "Speedomax" electronically-operated potentiometric indicators, recorders and controllers. Mechanically balanced recording potentiometers and electronically-operated high-speed indicators are shown as representative examples, as well as a recorder capable of plotting an X and Y function or two X functions on the same time co-ordinate.

For use with recorders of almost every type, Recorder Charts, Ltd., have on display a wide range of precision charts—rolls, circles and sheets—made of high stability paper to ensure minimum expansion or contraction under all conditions of climate.

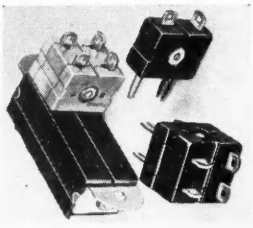
The complete range of "Gardsman" indicating pyrometric controllers, designed to maintain furnace temperature at a preset value, is shown by West Instruments. Also to be seen is the "Marksman" strip chart potentiometer recorder which employs a transistor amplifier enabling the instrument to start up immediately it is switched on, there being no warming-up period.

An a.c. electrical recorder has been developed by Servis Recorders, Ltd., for use with smoke control apparatus and similar devices to indicate the exact time and duration of the warning given. Nearly a hundred different types of the recorder are available to suit most existing machines and to indicate where improved efficiency can be effected.

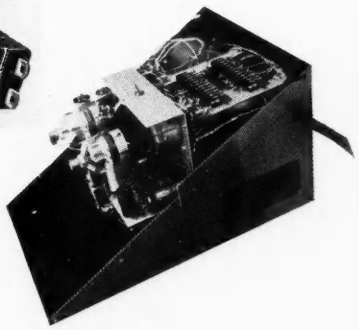
A range of dial thermometers, recorders and controllers for every industrial, marine, laboratory and domestic requirement is exhibited by the British Rototherm Co. For most normal purposes the bi-metal thermometer is suitable, but for such special applications as the indication of exhaust gas temperature a mercury-in-steel instrument is employed. The range also includes vapour pressure thermometers, pressure gauges, wet and dry bulb recorders and process batch recorders. A comprehensive range of temperature indicating and recording equipment is also displayed by Coley Thermometers. This includes dial, distance reading and electric contact thermometers as well as controllers and chart recorders actuated by vapour pressure and mercury-in-steel instruments. A range of pyrometer indicators and controllers is also shown. Under the name of "Transitrol," Ether, Ltd., are exhibiting a novel range of self-contained direct-deflection instruments for indicating and controlling temperatures between wide limits. The instruments can be used with thermocouples or other temperature sensing media or, in fact, with any signal that can be converted into a direct current or voltage.

On the stand of the Leeds Meter Co. there is a display of recording instruments and integrating meters including rotary and helix meters for the measurement of boiler feed water and industrial liquids, as well as for process control applications. For illustration purposes some of the instruments are sectioned and "exploded." Another item to be seen is the Leeds chart recorder suitable for incorporation in an instrument panel and operated by an electrical system of transmission from a distant meter.

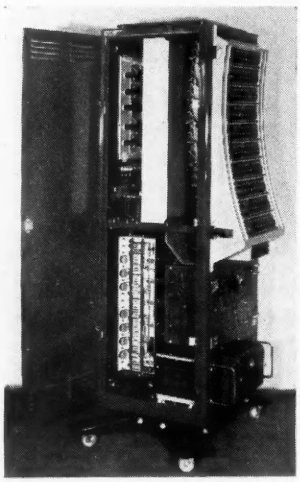
Automatic control apparatus for boilers and furnaces, including everything from steam pressure reducers and furnace gas analysers to remote sequential control for



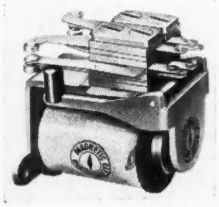
Left: These N.S.F.-Varicons connectors can be built up to any desired polarity arrangements



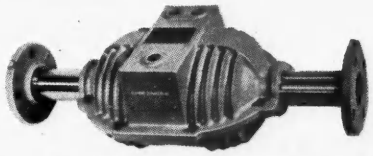
Right: Crompton Parkinson rectifier unit of the electronic controller for variable speed motors



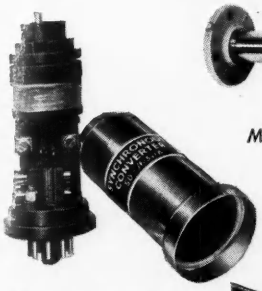
Philips pulse analyser, Type 1438 B



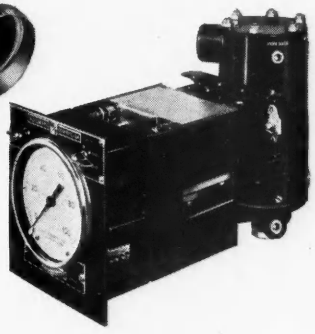
Magnetic Devices 590 relay



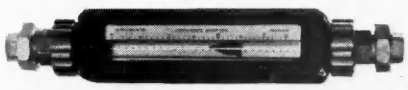
Magnetic flowmeter (Foxboro-Yoxall, Ltd.)



Above: George Kent synchronous converter



Right: Sunvic Controls 509 M plug-in controller



Metric series Rotameter Type 900 featuring interchangeable metric tubes and floats

soot blowers, is demonstrated by James Gordon, whose exhibit forms part of a joint display by Associated Automation. The Gordon pneumatic power operator, designed for remote or automatic operation of stop valves and the like, is expected to have special application in the operation of nuclear power plants.

The main theme of the George Kent stand is the "Commander" Class range of instrumentation designed to cover most industrial process measurement and control requirements. The extent and versatility of the display is sufficiently indicated by mentioning that the service covered includes temperature recording, flow control and integration, low-pressure air/gas flow ratio control, measurement of the oxygen content of flue gas, high-temperature pH measurement, and the metering of the flow of air, steam, water, methane, argon, nitrogen and oxygen.

Taylor Short & Mason have a display of graphic and centralised control panels including miniature indicators and recorders of their "Transet" series. Of particular interest is the "Flex-O-Timer," a timed programme controller of special use in the rubber industry and in platen presses as also in most processes involving automatic timing of the sequence and duration of operations.

Flowmeters are the main concern of Rotameter Manufacturing, who are showing in operation a continuous weighing density meter, consisting essentially of a loop of pipe carrying a flowing fluid weighed continuously on a pneumatic force balance. Any liquid or slurry that can be piped may be metered, subject only to the limitations of the flexible connections.

A range of new instruments exhibited by Kelvin & Hughes (Industrial) includes electronic controllers for industrial temperature control, flowmeters for indicating, counting and recording the measurement of many different fluids, and a new low-priced instrument for measuring smoke emission.

Complete systems of automatic process control are demonstrated by Foxboro-Yoxall. The display includes indicators, recorders, controllers, transmitters and their related sensing elements. Worthy of note is the new magnetic flowmeter, which measures the volume rate of all fluids with an electrical conductivity, such as corrosive acids, rayon viscose, sewage, sand and water slurries.

Magnetic Devices claim to have produced the first "transistorised" relay, operated by minute currents yet capable of switching loads up to 5 A at 250 V a.c. Also displayed is a relay having a contact assembly up to eight-pole change-over for use in the industrial, electronics and automation fields. Starting relays for small motors and a range of miniature a.c. and d.c. relays are also included. Crompton Parkinson are exhibiting a range of electrical measuring instruments including a selection of Admiralty pattern shockproof models, an overload device for electrically driven plant and an electronic speed controller for d.c. variable speed f.h.p. motors. The overload device is, in essence, a specially calibrated ammeter provided with a pair of contacts that close at full scale deflection to actuate a relay which modifies the operation of the machine. The speed controller is shown with a tacho-meter-generator and speed indicator to demonstrate continuous speed variation of a $\frac{1}{2}$ h.p. motor from 2,800 r.p.m. down to standstill.

Remote control provides the main feature of the N.S.F. display through the medium of the "Hedex" rotary solenoid and circuit selectors. This simple unit is designed to offer a degree of remote control formerly obtainable only with larger and more complicated mechanisms.

The aim of the Sperry Gyroscope Co. is to demonstrate how their equipment can be applied to servo problems in many different fields. Amongst a number of working rigs to be seen is a demonstration of the use of precision hydraulic piston-type pumps and motors for precise powered actuation, the use of tacho-generators for accurate speed comparison or feed-back signal, and a d.c. "step-by-step" vernier motor operating a simple servo system where no intermediate power amplifier is employed.

A section of the Ministry of Supply Research Development Establishment's stand is devoted to a demonstration of hand and seat movements at various frequencies up to 40 c/s. A specially mounted Chapman tank seat is employed for this purpose and some of the results obtained are displayed. Demonstrations are also given to illustrate the psychological and physiological reactions of human beings under stress. The recording by radio of the heartbeats of a human being engaged in vigorous action are also shown. Another interesting feature is a demonstration of equipment which can measure to an accuracy of one-hundred-thousandth of a second the interval between impact and detonation of a missile.

A wide range of devices in the fields of industrial control and measuring equipment is to be seen on the stand of Airmec, Ltd., i.e. photo-electric control, level control, high-speed counting are exhibited together with a range of instruments. The company is also showing an automatic voltage regulator rated at 5 kVA and designed to provide a constant output voltage independent of mains supply fluctuations and changes in load current.

An automatic climatic cabinet on the stand of Laboratory Equipment (London), Ltd., gives precise and accurate control of temperature and humidity and is based on creating humidity by means of atomised water instead of steam injection. This means that higher humidities are obtainable at temperatures from ambient upwards, which is important in testing packaging and products under normal climatic conditions. The company is also showing the new "Weyco" air flow laboratory oven which

is based on the positive air flow system used in the climatic cabinet. This is one of a series of hot air ovens, sterilising, chromatography and general drying ovens in which the positive air flow system of ductive air can be fitted.

An important item in the exhibits shown by Lancashire Dynamo Holdings, Ltd., is the Series SME 2 smoke alarm and densitometer which complies with B.S. 2811 and B.S. 2740. This equipment, utilising printed circuit techniques, represents a considerable step forward in design and offers many features not previously incorporated in this type of equipment at a price level which permits its application to the smallest industrial uses. The company is showing a wide range of equipment in the industrial electronic control field.

Servis Recorders, Ltd., are showing a recorder which has been designed to give a very clear reading on a chart to show when the current is flowing in the installation to which it is wired. The types of system in which it will be used are smoke control apparatus, thermostatically-operated motors, alarm systems, etc. Another exhibit is a mechanically-operated recorder which is installed in a centralised lubrication system to give an independent check on the times of lubrication.

Computers

The principal exhibit of Standard Telephones & Cables is the "Stantec Zebra" digital computer, a general purpose computer of medium size and speed for carrying out a variety of information processing problems arising in research laboratories, industry and commerce. The version to be seen is primarily a mathematical machine particularly applicable to mechanical, electrical and aeronautical design. Other versions are available for handling problems of accountancy, finance, production control and administration.

Among the industrial electronic applications which are shown by E.M.I. Electronics is a digital weighing system affording precise automatic control of weighing, batching, mixing or packing operations with the output directly in printed form, or in any other form acceptable by digital computers for further processing.

An interesting demonstration staged by Laurence, Scott & Electromotors concerns an analogue measuring instrument having an accuracy of $\pm$ 0·0002in in 5in. This device arises from one of the techniques developed for the automatic control of machine tools. An electric analogue computer is also on view.

A new computer, displayed by Metropolitan-Vickers, is designed for use in solving a wide range of mathematical, engineering and scientific problems. Like all digital computers, the Metrovick 950 is basically a machine that will calculate at high speed. It works in the binary notation, in which each digit represents a power of two. This system has the convenient characteristics that each numerical digit has only two possible values, 1 and 0, and these can be represented simply by the presence or absence of an electrical pulse in the computer.

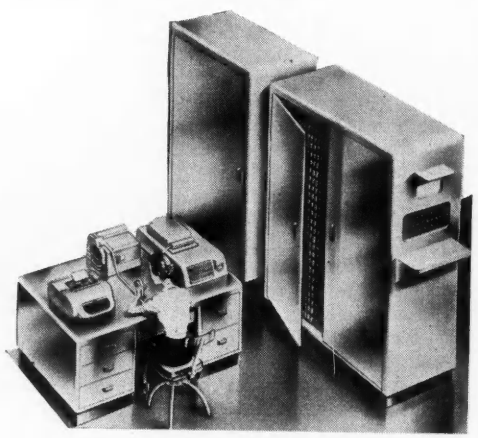
Evershed & Vignoles, Ltd., are showing a simple analogue computing device which will provide continuous and instantaneous solutions to algebraic equations occurring in the day-to-day operation of process controllers, boiler control schemes, and gas or fuel flow systems, etc.

Nuclear Apparatus

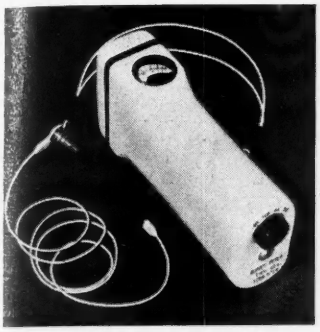
The main feature on the stand of Elliott Brothers (London), Ltd., is the application of instrumentation to the complete process of the generation of electric power from nuclear energy produced in a graphite-moderated, gas-cooled reactor similar to that at Calder Hall. It includes a reactor control desk, incorporating a small analogue computer to simulate the reactor operation, supervisory panels equipped for coolant gas (CO_2) flow, heat transfer in reactor and heat exchanger, gas pressure and purity maintenance, multi-point temperature measurement in fuel elements, detection of damage in fuel elements, position control and so forth, up to and including the complete turbo-alternator and power instrumentation. The remote handling equipment shown by Savage & Parsons which has been developed in collaboration with the A.E.R.E., Harwell, is now commercially available and includes master/slave manipulators for handling highly radioactive or toxic materials through protective screens or walls several feet thick. The manipulators will perform all tasks normally requiring human hands. Amongst monitoring equipment developed by Philips Electrical in conjunction with the U.K.A.E.A. for safeguarding the health of people employed in atomic projects, is a hand and clothing monitor for rapidly checking the hands and clothing of staff who have been in contact with radioactive substances.

Ekco Electronics are exhibiting a range of scintillation counters to meet all requirements in the fields of medicine, spectrum analysis, general research and industry. For prospecting, the "Prod" portable radioactive ore detector is designed for simplicity and convenience, enabling unskilled people to be employed in searching for radioactive ores. Other exhibits include a general purpose a.c. linear amplifier and a vibrating reed electrometer,

Elliott Brothers reactor simulator control desk

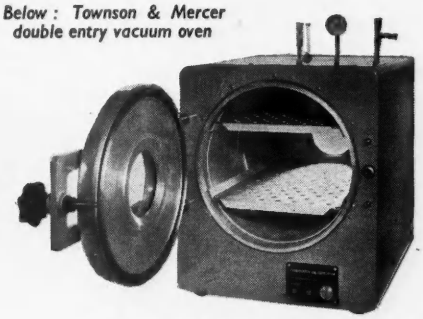


Electronic digital computer (Standard Telephones & Cables, Ltd.)



Ericsson survey meter Type 125 showing the complete equipment

Below : Townson & Mercer double entry vacuum oven



Right: Ekco Electronics single channel thickness gauge Type N565

developed in conjunction with the A.E.R.E., for ionisation current measurements. Of unusual interest is the high precision thermostat bath displayed by Townson & Mercer. With a sustained accuracy better than ± 0·001 deg C and an upper limit of 120 deg C, it has made possible the measurement of radioactivity by calorimetry.

The exhibits of General Radiological are all concerned with nuclear engineering. The geological survey unit being shown comprises a fully sealed tropicalised ratemeter for detecting and measuring gamma radiation and is suitable either for rapid search work or accurate measurement. The scaler unit presented is designed for use with a discriminator and a logarithmic ratemeter as a control element in the operation of nuclear reactors. A fast neutron counter, based upon the design recommendation of the U.K.A.E.A., provides a means of measuring with an accuracy of ±20 per cent, the biological hazard due to neutrons between the energy levels of 0·1 and 15 MeV. A portable fast neutron scintillation monitor, also to be seen, is designed to detect fast neutrons in the energy range of 0·1 MeV to 20 MeV.

One of the most interesting items in the exhibition is the working model of a nuclear reactor which is shown by Ericsson Telephones, Ltd. Visitors can get the "feel" of controlling a reactor using the instrumentation normally provided. The exhibit consists of two adjacent 6ft units, one of which contains the reactor model and the other the reactor power and deviation amplifier Type 129 and its associated equipment. The company has a number of other interesting exhibits which include the Type 125 survey meter, a portable radiation monitor which weighs 1½ lb.

Scientific and Industrial Equipment

The Department of Scientific and Industrial Research has organised a display of new instruments of a very diverse character. Many D.S.I.R. stations and allied research associations have contributed and twenty-five different instruments are exhibited. Of these it is possible to enumerate only a few characteristic examples, such as a lamination detector for the continuous inspection of strip, an exposure calculator for gamma radiography, a crease recovery tester, a single probe for testing thermal insulating materials, and a lustre meter and yarn speed indicator from the Rayon Research Association.

The British Electrical Development Association will stress the importance of instrumentation as a means of increasing productivity without heavy capital costs. Live demonstrations of the application of electronic equipment in a variety of fields indicate how production may be speeded up and men freed for more appropriate work. The equipment shown will include pH measurement as used in the food and chemical industries, temperature recorders and controllers, stroboscopes and isotope level gauges to measure the level of liquid such as molten glass in inaccessible tanks and so forth.

The four companies in the Pullin Group have combined to make a joint display of instruments and auxiliary equipment which includes gyroscopic devices, servo-components, hermetically sealed relays and an optical diffractometer designed for crystal structure analysis. In the aeronautical field there is the Pullin turn-and-slip indicator as installed in the Bristol "Britannia" and the De Havilland "Comet." Most of the instruments have been given a "new look" in the way of contemporary styling which has enhanced their appearance and afforded greater clarity and legibility.

A wide range of their latest instruments for industrial and scientific use is displayed by the Cambridge Instrument Co., Ltd. The main exhibits include temperature measuring instruments for all industrial purposes and range from inexpensive vapour pressure types to comprehensive installations for multi-point distance indication; fuel efficiency instruments for boiler control, dynamometers and galvanometers, as well as instruments for chemical analysis and research such as pH meters and polarographs.

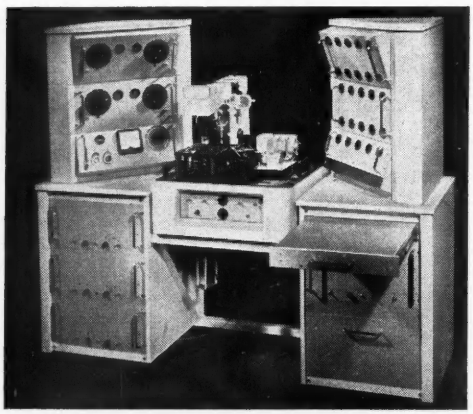
Electrical instruments for industrial and laboratory use can also be seen on the stand of Nalder Bros. & Thompson, in particular the derivative relay to give an alarm or initiate corrective action when the rise or fall of current exceeds a preset level. A locking indicator enables a deflection to be locked at any desired instant and read at leisure, while there is an indicator which displays the mean level of steady d.c. in the presence of a very low-frequency superimposed a.c. ripple. The display of Hendrey Relays embraces such diverse equipment as geological survey instruments, vibration tables, auxiliary control gear for aircraft, spark recorders and radar screen illumination units.

Among the range of scientific glassware on the stand of W. G. Flaig & Sons is the new safety pipette which banishes the old and unsafe method of mouth suction, while the new all-glass stopcock affords the operational advantages of interchangeability and non-seizure when used with alkalis. Other new items are a high purity water still, vacuum desiccator and the latest modified Scholander micrometer gas analyser. C. F. Casella & Co. are showing a broad range of scientific instruments which include the newly developed automatic particle counter which, using the principle of wide track scanning and variable sensitivity, can count and separate into size groups particles in the range of 2 to 100 microns in a fraction of the time taken by former methods. With the

use of four sensitivity channels, analysis time can be reduced by a factor of between 3 and 4. An equally diverse display of instruments is staged by W. G. Pye & Co., the most interesting, perhaps, being the thermocouple test set which combines potentiometer, galvanometer and batteries in a small portable case.

The nucleus of the exhibit of Baird & Tatlock is their " Analmatic " automatic instruments which include the uranium analyser for monitoring the concentration of this element in liquors from a maximum of sixteen different sources, an auto-titrator, a continuous flow absorptiometer, gas analysis equipment and a bomb calorimeter. As might be expected, Negretti & Zambra concentrate on a range of meteorological instruments.

The developments in the range of electronic welding and process timers presented by British Federal Welders & Machine Co. are directed towards the requirements of



C. F. Casella automatic particle counter

automation and a scale model of a fully automatic press line for the production of motor vehicle underbodies is on display. The equipment comprises a series of large multi-gun welding machines fed from an automatic conveyor line. Pressings forming the complex structure of the underbody are loaded on to jig trucks which are sequenced round the conveyor system from a control " brain " which provides full interlocking on each section. A total of some 750 spot welds are made as the components pass through the welding line.

The scientific value of sieves is strikingly illustrated by Endecott (Filters), Ltd., who are showing some in stainless steel and others coated with polythene and nylon, fitted with nylon and silk weaving, which are resistant both to corrosion and abrasion. A demonstration of rapid separation of particles in an Endrock vibrator shows a mixture of coloured material inserted in the top of a nest of sieves which, in approximately 30 seconds, is graded into six different sizes each of a distinctive colour.

Exhibits by the Sigma Instrument Co., Ltd., demonstrate the other end of the production line, i.e. the automatic inspector. The company also has on view the " Sigmatrol Major " which will automatically control and correct a grinding machine for variations due to wheel wear. After a predetermined number of parts have been ground the device will (*a*) stop the hopper feeding unit of the machine, (*b*) cause the wheel to be automatically re-dressed, (*c*) in-feed the wheel heads after re-dressing to a position so that parts are ground to the bottom control limit and (*d*) re-start the hopper feeding unit of the machine.

One of the highlights of the exhibits by Mullard is the " Autoplot," a new and electronically controlled automatic co-ordinate positioning machine for drilling, marking-out, plotting and other operations on sheet materials of any kind. The tool head is moved over the work table to any required position simply by setting-up the appropriate X and Y co-ordinates on rotary dials and switching on the drive motor. The device has applications in any industry where precision work on sheet material is practised.

Devices which have been developed for labour saving in almost every phase of office procedure are exhibited by Ozalid Co., Ltd. The company now has the " Ozamaster " and " One-Step " machines which give a greater degree of automatic operation than is possible with other processes. These two machines are capable of a finished print production rate of 30ft and 24ft per minute, respectively.

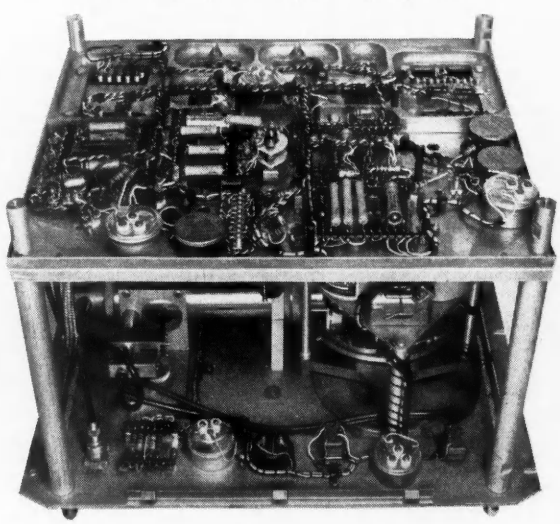
Included in the range of de-ionisers and control equipment shown by Elga Products, Ltd., is a portable and self-contained unit specifically designed for the research laboratory and pilot scale production. It provides purified water, equal to three distillations in quartz (conductivity water) from tap at flow rates of 75 litres/hr. For the laboratory production of cathode-ray tubes and valves, transistors and other electrical components, this model provides conductivity water from tap.

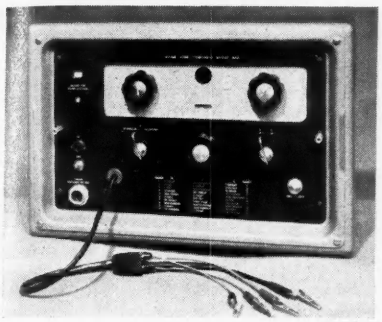
A wide range of newly-developed microwave test equipment is demonstrated by W. H. Sanders (Electronics), Ltd. Included in the products on view are a low speed, low frequency oscilloscope using a DP 13-2 5in long-persistence tube employing post deflection acceleration and an ignitron spot welder controller.

The Stabilag Co. show electric heating tapes for defrosting and keeping pipes at a constant temperature. Six tapes are being demonstrated. The company is also exhibiting a resin-bonded circuit system and a range of electrically heated flash mantles which is considered to be an economical way of supplying heating in laboratories. Williams & James (Engineers), Ltd., have on their stand an interesting range of valves together with a selection of compressors; their oil-free compressors, which are now being manufactured in single-, twin- and four-cylinder models, have been developed for use with pneumatic controllers and instruments where completely " oil-free " air is essential.

Specially designed cables for use with automatic control

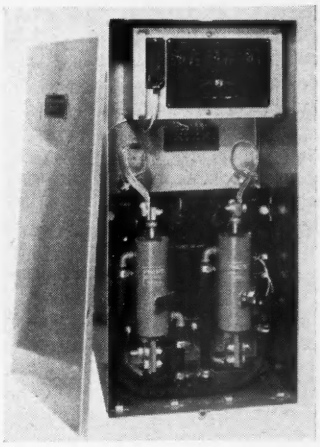
W. H. Sanders (Electronics), Ltd., signal generator

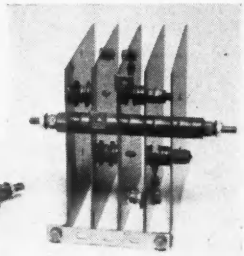




Left: Wayne Kerr component bridge Type B 521

Right: Ignitron contactor and heat control unit (British Federal Welder & Machine Co.)





Right: Typical germanium rectifier stacks using G.E. x 541 germanium diodes (General Electric Co., Ltd.)

equipment are on show at the stand of "Davu" Wires & Cables including many types evolved for electro-medical, design and research laboratories. Other exhibits illustrate the progress that has been made in miniaturisation. A new low-inertia integrating motor having a minimum sensitivity of 6 microwatts and capable of integrating voltages against time to an accuracy of better than 0·5 per cent and also provided with a resettable counting mechanism is shown by Electro Methods, Ltd. Also included in their exhibits is a wide range of relays covering light duty, sensitive moving-coil relays, to heavy duty four-pole change-over types of high loading and small physical dimensions.

A display which demonstrates the operation of its fire detector is given by the Minerva Detector Co., Ltd. This new nuclear alarm sounds off at the first sign of smoke from smouldering material, long before any appreciable heat is generated or any flame breaks out. The sensitive element is a small ionisation chamber, the electrical characteristics of which are radically changed when the first trace of the products of combustion reaches it.

A wide range of axial flow blowers by Plannair, Ltd., have been designed on an entirely new set of principles governing air flow. They have high operational efficiency combined with small physical size and may be used wherever forced air cooling is required. Of special interest in this field is a photographic illustration of the use of three axial flow blowers, each 4in in diameter, which are used in the cooling of the new 36in telescope of the Cambridge University observatories.

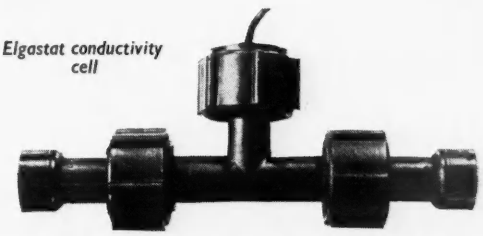
Communications Equipment

More than thirty telecommunications test instruments, all of recent design, are shown by Marconi Instruments, Ltd. A section of the stand is devoted to industrial television equipment and test apparatus for use with multi-channel radio link equipment. The new instruments for testing v.h.f. mobile radio are publicly seen for the first time. The equipment comprises a v.h.f. signal generator and a transmitter and receiver output test set. The signal generators include two new f.m./a.m. instruments. The counter-type frequency meter is demonstrated working with an electronic counter/timer; frequencies from 0·1 to 64 Mc/s can be measured to one part in a million ± 1 c/s using this combination of instruments.

Racal Engineering are exhibiting two digital frequency meters covering the ranges 0 c/s to 1 Mc/s and 10 to 30 Mc/s respectively. Each has an accuracy of 1 part in 10^6 ± 1 count, is self-checking, embodies six decade illuminated presentation and uses plug-in units with printed wiring.

All the facilities necessary for servicing v.h.f., television and radio receivers, including very narrow band receivers, are provided by the signal generators exhibited by Advance Electronics. Other instruments include a "Q" meter for measuring and comparing circuit magnification and inductance, and for the measurement of capacitance and power factor.

Elgastat conductivity cell



The Wayne Kerr Laboratories are exhibiting audio and video oscillators, a portable mains operated audio frequency analyser and an inductance meter designed to give simple and direct measurements between 0·05 μH and 100 μH. The new component bridge on view is a development of the transformer ratio-arm technique; operating at mains frequency it has an effective ratio of 10^{12}:1 and affords rapid and direct measurement of virtually all components and networks likely to be encountered in electronic apparatus.

Television camera tubes for both broadcast and industrial use are exhibited by Cathodeon, Ltd. The "Staticon" photo-conductive camera tube is said to be incorporated in over 90 per cent of industrial television installations in Great Britain, notable users being Harwell, Calder Hall, I.C.I., Bristol Aircraft and the Colville Steel Works.

Comprehensive ranges of instruments and electronic valves are exhibited by the General Electric Co., Ltd. The former includes a portable load analyser for single and polyphase circuits while the latter covers most types of valve for radio and industrial use, the new high-power thoriated tungsten filament transmitting valve being of particular interest.

The English Electric Valve Co. are displaying a complete range of valves for every type of application. Of industrial interest are the radio frequency heating valves now finding ever-increasing use. In the field of

television there is a series of TV camera tubes and the Orthicon pick-up tubes used for outside television. A complete range of travelling wave tubes are also included, permitting the use of radio frequency amplification in radar, tropospheric scatter and other microwave equipment.

In the range of xenon rectifiers are to be seen the highest current and highest voltage xenon diodes yet manufactured in this country. The new series of hydrogen thyratrons incorporates the barretter-controlled hydrogen replenisher system, another feature being a system of double triggering enabling a reasonably low value of jitter to be obtained.

The new ohmmeter shown by Murphy Radio is designed to facilitate rapid circuit testing on the production line and it provides continuous coverage from 0 to 10 megohms in six ranges, selection being by means of a remotely controlled electromagnetic switch unit. A television turret coil tester, also new, is applicable to the production testing of the inductance of coils used in turret turners, two similar types being available for either band 1 or band 3 coils.

The electronics division of Millett, Levens (Engravers) is showing various electronic units such as v.h.f. remote control units, frequency multipliers and oscillators and a device for counting up to 30,000 a second, as well as amplifiers using the "Plasmet" printed circuit.

The applications of printed circuits and their uses in the radio, television and electronics industries form the subject of a demonstration by the Telegraph Condenser Co., Ltd.

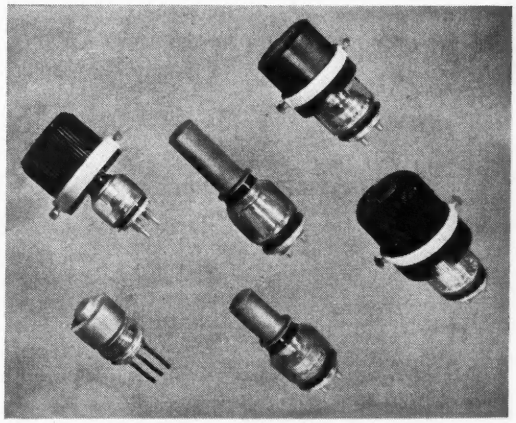
Optical Equipment

Unicam Instruments are exhibiting a range of spectrophotometers and crystallographic instruments for the precise analysis of a wide variety of materials. The central piece of the display is a double-beam infra-red spectrometer providing fully automatic operation with recording facilities. Noteworthy features are an evacuable optical system, automatic interchange of prisms and cams, magnetic slits and starwheel beam attenuation. A high sensitivity flame photometer for the analysis of a wide range of elements in very small concentration is of particular interest to clinical chemists.

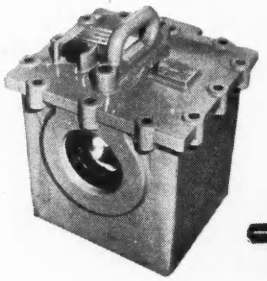
Included in the display of optical instruments by Hilger & Watts is a recording double-beam, infra-red spectrophotometer, the "Uvispek" spectrophotometer with photomultiplier attachment, a photo-electric polarometer, and a recording flow-through refractometer. A direct-reading attachment to the medium quartz spectrograph will enable the instrument to analyse up to ten elements in approximately two minutes.

R. H. Beck, Ltd., are presenting a number of new optical instruments including a research binocular microscope which, with accessories, can easily be adapted to cover a wide range of work. Amongst a variety of alternative bodies available is a combined unit for continuous observation and photomicrography. Other equipment to be seen are a stereoscopic binocular microscope with a magnification range 4× to 120×, and an automatic grinding and polishing machine for preparing metallurgical specimens. W. R. Prior are also exhibiting a range of microscopes for research and industrial use, which includes stereoscopic binocular instruments for examining small machine parts and for inspection control of fine filaments and coil windings.

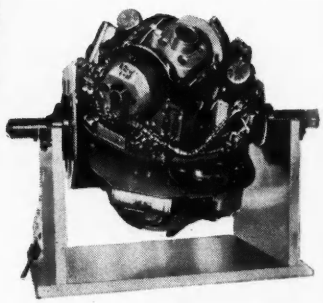
On the stand of Aldis Brothers, Ltd., there are shown the latest types of slide projectors, viewers and epidiascopes, as well as their traditional signalling lamps and gun sights. The new projectors are designed to give greater brilliance with lower power consumption, while a remote control unit for automatic slide changing enables a lecturer to remain at the screen and change slides by merely pressing a button. The "Epivisor," an extremely versatile projector, can be used for projecting photographs, manuscripts, coins or butterflies with equal facility. A suitable attachment enables film strips, miniature and micro slides to be shown.



Group of specially designed high perveance valves for r.f. heating (English Electric Valve Co.)



Left: Flameproof electronic flash unit (Ernest Turner Electrical Instruments, Ltd.)



Right: Platform assembly showing azimuth gyro (S. G. Brown, Ltd.)

The Lovibond Schofield tintometer, presented by Tintometer, Ltd., affords improved discrimination between small colour differences in dark samples, readings being convertible to the x, y, z values of the C.I.E. international system. The portable tintometer, originally designed for measuring the colour of skin in research connected with radiation burns, is now applicable to any colour measuring problems. As engineers to the optical and glass trades, Autoflow Engineering exhibit a range of new machines for grinding and polishing every type of lens.

An electronic flash unit for photographic lighting, certified as flameproof, exhibited by Ernest Turner Electrical Instruments for the first time makes possible high-speed photography in an inflammable atmosphere.

Included in the comprehensive range of Bellingham & Stanley optical instruments shown is the pre-production model of a new photo-electric polarimeter. This instrument cuts out all eyestrain and allows greater accuracy of reading.

Aeronautical Accessories

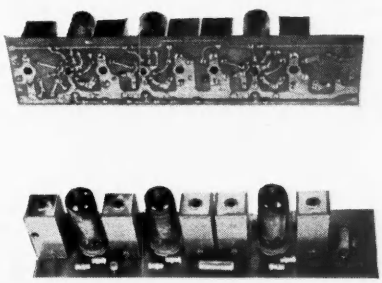
A range of instruments, mostly for aeronautical use, is displayed by S. G. Brown including a master reference gyro for aircraft which is claimed to be revolutionary in

design and the first of its kind. A working model of a gyro compass element is on display together with control gyroscopes for torpedoes.

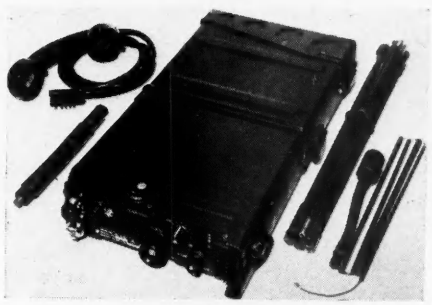
Appearing on the stand of the Telegraph Condenser Co. are new ranges of p.t.f.e. (polytetrafluorethylene) dielectric condensers, miniature tantalum electrolytic condensers for use with aircraft instruments and sub-miniature transistor circuitry, and metallised polystyrene condensers of exceptional electrical properties for tuned filter circuits.

The main exhibit of the Sperry Gyroscope Co. has already been mentioned under "Recording and Control Apparatus." The company also have one or two smaller exhibits which will remind visitors of their achievements in the production of instruments for marine and aeronautical navigation. A turn-and-slip indicator, which is installed in most types of service aircraft, in the Bristol "Britannia" and the De Havilland "Comet," can be seen on the stand of the Pullin Group.

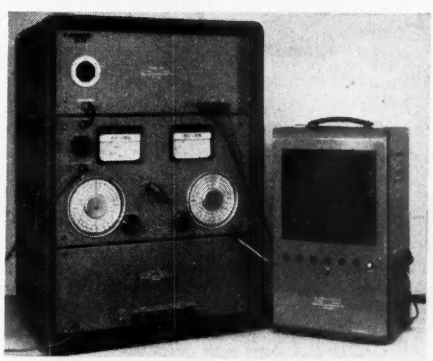
In the foregoing, incidental mention has necessarily been made of a number of components forming part of the equipment described. It has, however, been considered helpful to record under this heading a variety of basic components which manufacturers are displaying.



35 Mc/s i.f. strip incorporating T.C.C. printed circuit panel. (Telegraph Condenser Co., Ltd.)



Murphy Radio portable f.m. transmitter receiver



Marconi Instruments counter-type frequency meter OA.1071 in use with TF 922/2 electronic counter

From their wide range of carbon components the Morgan Crucible Co. have selected a number designed for service in electrical and mechanical engineering. These include sintered metal, friction faced clutch plates for automatic equipment employing this method of power transmission; sintered metal oil retaining bearings and inserts, as well as valve anodes, ultra-high ohmic resistors, high-voltage loading resistors and a full range of fixed and variable resistors for every type of application. A wide range of capacitors and resistors is shown by the Dubilier Condenser Co. Among the former is a new metal-cased tubular model for use in automatic equipment, "Nitrogol" high performance capacitors and a full range of stacked foil and silvered mica capacitors. Included also are the newly developed pulse-forming networks encapsulated in epoxy resin, low in weight and with no liquid filling, suitable for service under extreme climatic conditions.

Compressed air is now widely used in connection with both instruments and automation equipment, C. A. Norgren are featuring a number of practical displays showing the application of their products to this service. Various combinations include air filters and purifiers; pressure regulators; the "Spray-Lute" and "Mistcool" systems of cutting tool lubrication, as well as compressed air line lubricators of the oil-fog and micro-fog types.

Langley London, Ltd., specialising in insulation, offer mica and micanite materials in all shapes and forms, laminated plastics of paper, fabric and glass with bonds of phenol, epoxy and silicones; also combination insulation and varnished cloths and tapes.

Samples of high machining to accurate limits, pressings and assemblies, and examples of etched circuitry for computers, radio and so forth are displayed by Millett, Levens (Engravers). A recent development is the economical production of small and medium quantities of laminations of special shapes in a variety of materials without press tools. Intricately shaped specimens of this technique are on view.

The Worcester Royal Porcelain Co., Ltd., has on view a number of highly specialised technical ceramic products. The range illustrates the bonding of ceramics to metal for equipment intended for uses in which high heat resistance is essential.

Station with 550 MW Sets Planned

THE Central Electricity Authority announces that investigations have shown that a site at Thorpe Marsh, to the west of the new course of the River Don, some four miles north-east of Doncaster, is suitable for a major coal-fired power station. A station with an output of 1,100 MW is planned. The generating plant to be installed is a striking technical advance, a single unit having an output of 550 MW, which is twice as much as any generating unit so far planned for any other part of the country and has four times the output of the whole of the Doncaster power station. It is believed that this unit is the largest so far projected anywhere in the world. The approximate cost will be £40 million.

A station of this size will require more than 2½ million tons of coal per annum and the delivery of 10,000 tons of coal per day is a big transport problem. The site proposed has the advantage that most of the coal can be delivered by rail over the Gowdall to Braithwell mineral line which is at present little used and was otherwise becoming redundant. It is hoped that an application for the consent of the Minister of Power to the establishment of this power station will be made later this year. In the meantime, discussions will proceed with the owners of the land and the public bodies concerned.

FACTORY EQUIPMENT EXHIBITION

OVER 300 exhibitors took part in the fifth Factory Equipment Exhibition, the largest so far, which was held last week at Earls Court, London. The exhibition, sponsored by the proprietors of the *Factory Manager* and *Factory Equipment News*, was opened by Mr. Iain Macleod, Minister of Labour and National Service, and had the support and co-operation of the British Productivity Council and leading trade and industrial associations.

Among the exhibits there was a wide range of electrical apparatus covering such fields as heating and ventilating plant, fuel economy equipment, forklift trucks, instruments for automatic control, pumps, clocks, fire alarms, and lighting. Visitors to the British Electrical Development Association's stand saw many electrical and electronic devices for controlling industrial processes. Much of the apparatus was shown in operation and included such items as an isotope liquid level gauge which will indicate and control the level of liquids or granular solids such as molten glass in a furnace, slag in a blast furnace, and liquids in high-pressure vessels; an automatic register control that ensures accurate positioning of fast moving webs in printing; a fully automatic proportional feed control, for power operated feeders of granular or powdered material being conveyed to processing machines; and a high-speed weighing machine capable of carrying out 20 to 24 weighings per minute to an accuracy of ½ per cent. There was also a pH recorder-controller for measuring electrically the alkalinity or acidity of liquids, including public water supply.

The General Electric Co., Ltd., displayed for the first time a shallow underfloor ducting for cables and a new 1 kW infra-red lamp for industrial heating applications. There was also a "preview" of the new "Osram" 400 W colour-corrected lamp which has a higher red content than its predecessor. Emphasis was given to heating, lighting, cooking and food storage equipment. Immersion and storage water heaters were displayed and there was also a demonstration of the company's smoke density monitor. Included in the motor display was a new range of f.h.p. motors to B.S. 2048 : 1953, frame B.56.

Apart from the display of type MC switchboards designed for controlling power station and industrial systems at medium voltage, three- or four-wire, a.c., the exhibits on the Metropolitan-Vickers stand consisted of examples from the company's wide range of heating equipment. These included a large 108 kW industrial type immersion heater, comprising a large number of elements mounted in a flange with the busbar terminal system on the reverse side. This heater is typical of equipment used for heat transfer between liquids. The company also exhibited an industrial type high intensity radiant heater; a number of new 3 kW space heaters; and heating element display panels showing various types of sheathed elements and typical applications.

Ventilation and air conditioning are important in factories and several companies had equipment of this nature on view. Colt Ventilation, Ltd., displayed their "Two-Way" fan, claimed to be the only one of its kind which simultaneously extracts stale air and brings in fresh replacement air, using only one fan impeller. The company has also introduced a new fusible link ventilator, a dual-purpose unit to combine normal ventilation requirements with a fire safety measure. The unit ensures the exhausting of smoke and heat in the event of fire, whether the ventilators are open or closed at the time of the outbreak, to aid fire fighting and avoid a horizontal spread of fire.

P. M. Walker & Co. (Halifax), Ltd., specialise in air treatment problems involving air conditioning, dust control equipment, induced draught and humidification, and the Clean Air Bill has led to the development of new equipment for fly-ash and dust collecting. Typical of this is the new "Upblast" positive air vent design. It is equipped with a propeller fan directly connected to a totally enclosed motor. Sizes range from 21 to 54in inside diameter, and the air movement ratings range from 2,000 to 27,000 cu ft/min. Units can be supplied with flameproof motors, special protective finish and treatment, etc., if desired. The Harris Engineering Co., Ltd., showed a range of "Trion" electronic air filters.

Vacuum cleaning plants were well represented. Industrial Vacuum Cleaning, Ltd., showed their new "Mr. Ivac" model which is claimed to have twice the power and half the weight of similar machines. It is capable of wet and dry pick-up, which means that dirty water, swarf filled fluids, sump oil, etc., can be speedily cleaned up, as well as the usual dry materials, without any alteration or adjustment by the operator. Consumption of the turbo pump unit is 1,400 W and it has a liquid capacity of 12 gal. The range of floor cleaning plants manufactured by Columbus Dixon, Ltd., New Welbeck, Ltd., and the Rapid Electric Scrubbing Co., Ltd., were also represented on their respective stands. Truvox, Ltd., have entered the industrial vacuum cleaner market and showed for the first time their new heavy duty vacuum cleaner. It is powered by a 600 W motor, has two turbine fans and passes 78 cu ft of free air per minute.

There were numerous displays of private telephone equipment, telephone amplifiers, staff locators, public address equipment, etc. Among the exhibitors of this type of equipment were Fonadek (Branson), Ltd., Multitone Electric Co., Westrex, Ltd., and Siemens Edison Swan, Ltd. The last-named company also displayed lamps and lighting equipment, including fluorescent and bulkhead fittings, and demonstrated the "Sieline" lighting trunking.

There was a wide selection of trucks and trolleys on view. Brush Coachwork, Ltd., exhibited several of their battery-electric industrial trucks and tractors, including a new pallet transporter capable of carrying standard pallets for 2-ton loads.

"Nalock" electrically operated stapling gun (Britannia Engineering Co.)

Truvox industrial vacuum cleaner

Vibro-electric equipment for bulk feeders and material conveyors, down to small-scale equipment for use in laboratories and pilot plants, were shown by Podmores (Engineers), Ltd., while Scintilla, Ltd., displayed a full range of "Bosch" and "Lesto" electric tools.

The Britannia Engineering Co., Ltd., demonstrated the "Nalock" electrically operated stapling gun, claimed to be the first tool of its kind. It has a switch in the handle, and a light finger action on the firing button enables the operator to select a continuous or intermittent rate of ejection.

ATOMIC STALEMATE?

A REPORT FROM WASHINGTON, D.C.

BRITAIN'S programme for atomic energy, tripling the original proposals, has provided the domestic critics of the American Atomic Energy Commission with another stick to beat it with. This is an old controversy, but the charges are now more specific: that first Britain, then Euratom, not to mention the more secretive Russians, are gaining the only kind of experience which really counts, that of building large-scale nuclear reactors, while the United States fritters away its initial lead on a variety of experiments and prototypes. Both for reasons of national prestige and for the sake of future export orders, the Federal Government is being urged to build industrial reactors itself instead of waiting for private enterprise to nibble at the subsidies being dangled before it.

The response of Mr. Strauss, the A.E.C.'s chairman, and his technical staff is that in the United States, where supplies of conventional fuels are cheaper and more plentiful than in Europe, the new source of power has to undergo a much severer economic test. According to the official argument, this can best be met by combining private enterprise and its cost-cutting incentives with research by the Commission on the greatest practicable range of promising types of reactor and an austere refusal to give a permanent subsidy to the production of electric power from atomic energy by linking it, through dual purpose reactors, with the production of plutonium. Further, the majority of the Commission holds that, with the exception of the British and their gas-cooled reactor, no-one is ahead of the United States.

Nuclear power development in the United States is of considerable interest and importance to Great Britain. This article, reproduced from *The Economist*, by kind permission of the Editor, is an admirable summing-up of the present situation

The A.E.C.'s present plans are for three stages in the development of energy from nuclear power. During the first, which extends until the end of 1959, ten experimental plants are expected to produce electricity. But of the total generating capacity of 130,000 kW, no fewer than 100,000 kW are accounted for by one large-scale plant, the pressurised water reactor at Shippingport. A private company is participating rather nervously in this project, but all of the plants, with one exception, will be owned by the Federal Government; they are the fruits of the early decision by the A.E.C. to experiment on a variety of types. A boiling water reactor, with a generating capacity of 5,000 kW, has been providing the power for the A.E.C.'s Argonne laboratory since February; a " reactor package," which is theoretically though rather clumsily mobile and is meant to produce electricity at isolated military posts, was opened by Mr. Strauss this week; and there will also be sodium, homogeneous and two breeder reactors.

The second stage, nicknamed " the first generation," is to last from 1960 to 1964, when the plants at present being planned, and in a few cases already being constructed, on a partnership basis between industry and Government, will come " on stream," together with at least two projects to be wholly financed privately, and perhaps two or three to be financed by the Federal Government. According to the A.E.C.'s leading technicians, costs at these plants will be lower than at the experimental models, but will still not be competitive with the most advanced conventionally fuelled power stations. It is thought, however, that the costs will be comparable and possibly a little below those which would be charged by British plants, if costing were done on the same basis.

It is this second stage of the A.E.C.'s plan which is felt to be lacking in real American drive by the Democrats on the Joint Atomic Energy Committee of Congress; they are backed up by the " odd man out " on the Commission itself, Mr. Thomas Murray. The main contribution is to come from the power reactor demonstration programme. Under this projects proposed by private enterprise, if acceptable to the A.E.C., are subsidised to a specific extent, usually in the form of Government research and development and the lease of enriched fuel without charge.

To begin with, in 1954, came large-scale projects. Of the three then launched, two, for a pressurised water plant in Massachusetts and for a sodium graphite reactor in Nebraska, have run into serious technical delays and major increases in costs. The third, a fast breeder reactor in Michigan, is going ahead on schedule, but it has not yet been finally cleared for safety.

After that came proposals for smaller reactors, of the kind which might ultimately prove most useful in the export trade and in bringing down to the national average electricity prices in high cost areas in the United States. Three of the seven projects in this group were rejected by the A.E.C. as inadequate, and none of the remaining four has got much beyond the conceptual stage. Finally, early this year, in order to pacify the Commission's critics, industry was asked to make clear in the reasonably near future what would be its maximum accomplishments by 30th June, 1962. The Commission undertook to step in and do the job itself if industry failed to come up with enough suggestions, particularly in relation to two concepts which are not yet being tried out. So far the industrial response to the request has been vague and the political response negative, with no noticeable diminution in the volume and tone of the criticism.

" Second Generation " Era

But it is in the stage after this, in the era of " second generation " nuclear plants, from 1965 onwards, that the A.E.C. calculates that atomic energy will become economically competitive. To some extent, the turning point will be psychological—when simultaneously a fairly large number of electricity producers and manufacturers become confident that the plants will be economic when built and can be successfully operated over a long period of time, during which coal and oil prices will be increasing slowly.

In the meantime, there is political *débris* to be cleared. In the present economy-minded mood of Congress, it seems most unlikely that democratic critics of the A.E.C. can put through a Bill forcing it to undertake Government projects that it does not consider useful. However, Mr. Strauss's opponents have certain cards to play, which could induce him to make some concessions to the Democratic point of view. The most important is the urgent need for a Bill providing Government indemnities for private industry to cover liabilities in case of

catastrophe at an atom plant. The General Electric Co. has bluntly threatened to withdraw from all major projects if this measure is not passed at this session of Congress. The Democrats will have to decide whether they really want to deal this much of a setback to such progress as is now being made in order to punish Mr. Strauss for not making the greater progress which they are powerless to force on him. The Democrats might be prepared to withdraw their veto on the Indemnity Bill, to ratify the International Atomic Energy Treaty, and to speed the A.E.C.'s appropriations in return for a lesser concession, such as the re-appointment to the Commission of the persistent dissenter, Mr. Murray, when his term expires in June. But it would be the very acme of futility if this congressional session ended in the atomic stalemate which overtook the last.

MACHINERY TRADES CONVENTION

CLASS "E" MOTORS DISCUSSED

WHEN the Annual Convention of the Association of Electrical Machinery Trades was being arranged it was feared that petrol rationing might have some effect upon the attendance, and it was therefore decided that this year it should be entirely informal with no special functions. Despite petrol restrictions, however, the attendance at the Queen's Hotel, Eastbourne, from 27th to 30th April, was almost as good as in other years, and as informality is the keynote of these conventions, this year's programme differed little in this respect from those of earlier conventions. In place of papers, there was a discussion between members, which probably proved more stimulating, and an instructive visit to the works of Allen West & Co., Ltd., Brighton.

The fine weather associated with these meetings has become proverbial, and this year was no exception. Members with their ladies began to arrive on Saturday afternoon in brilliant weather, early arrivals including Mr. A. H. Spindler, chairman of the Association, and Mrs. Spindler. After dinner there was dancing in the hotel restaurant. Sunday was a free day and many of the members took the opportunity to visit the ancient Cinque Port of Rye.

The first business session was on Monday morning when the Council meeting was held. In the afternoon the members and their ladies went by coach to Brighton, and while the ladies explored the town the members went on to the East Moulescoomb works of Allen West & Co. On arrival they were divided into small parties, each under a guide, and conducted round the works, in the course of which they saw motor control gear and switchgear for marine auxiliaries, mining, steelworks, gasworks and other purposes being manufactured and assembled. After the tour the members rejoined the ladies at the Ship Hotel, Brighton, where they were entertained to tea by the company, during which Mr. Spindler expressed to Mr. J. H. Hall (director of Allen West & Co., Ltd.), the thanks of the members for an instructive afternoon and for the company's hospitality. Returning to Eastbourne, there was an informal dinner and dance, during which Mr. H. Vernon (vice-chairman), who is an amateur member of the Magic Circle, demonstrated that he is a worthy member of that mystic society.

The discussion at the final session on Tuesday, over which Mr. Spindler presided, was mainly concerned with the new Class "E" insulated motors. Mr. R. A. Joseph, who opened the discussion, said that these motors got hot and he suggested that a temperature of 90 deg C might be unacceptable for certain uses, apart from the fact that the machine operator might find the heat radiated uncomfortable. Two classes of motors, "hot" and "cold," might be desirable, and in any case he thought that customers should be made aware of what type of motor they were getting when Class "E" motors were in question. He emphasised that there was nothing wrong with the heating up of the motor casing, but it was important to install the right motor for a particular job.

Mr. T. A. Atkinson maintained that it did not matter how hot motors got so long as they continued "motoring." Speaking of silicone varnishes, he said that although these were water repellent they were susceptible to water vapour and steam. Mr. C. G. Aldridge said that the danger of high temperature motors was that they might be installed in some factories where they were not properly understood.

Mr. J. S. Hann, replying to the point on silicone insulations, said that certain silicone materials were moisture repellent and some moisture absorbing, but with the modified silicones they got the best of both worlds.

Mr. Atkinson asked if it were true that the C.E.A. was establishing central repair shops. Mr. Joseph said that he had seen a shop labelled "repair" at one of the power stations, which suggested that the Authority was intending to establish such shops.

Other matters discussed included the training of youths in repair shops. Mr. D. R. Reekie spoke of the difficulty of obtaining lads who found that they could get higher wages in other jobs. Mr. Spindler agreed that the difficulty existed. He had found it necessary to take in three or four lads in order to keep one for a five-year apprenticeship. His company, however, did all it could to encourage the lads to stay and gave them time off to attend classes.

Members of the A.E.M.T. at the works of Allen West & Co., Ltd. Mr. A. H. Spindler, chairman of the Association, is fifth from the left

GENERATION AND DEVELOPMENT

C.E.A. Contracts

Contracts have been placed by the Central Electricity Authority during the past month for power stations amounting in the aggregate to £11,383,000. The principal contracts include the following:—

Belvedere power station, near Erith: Foundations for turbo-alternator sets. —John Mowlem & Co.

Drakelow "B" power station, Burton-on-Trent: Three 860,000 lb/hr boilers.—Foster Wheeler. Three cooling towers.—Davenport Engineering Co. Foundations for cooling towers, circulating water pump house foundations, ponds and culverts.—Bierrum & Partners.

High Marnham power station, near Tuxford: One 200 MW reheat boiler. —International Combustion. Second half foundations.—Taylor Woodrow Construction.

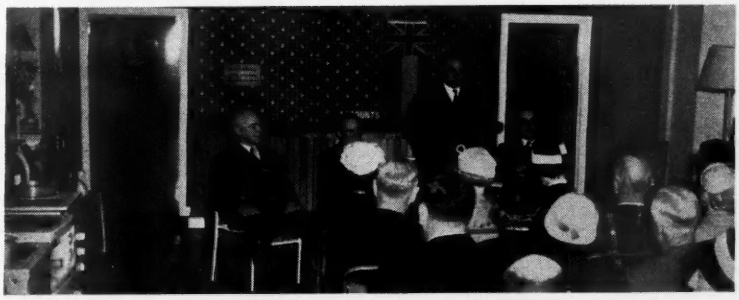
Skelton Grange, Leeds: Foundations.—J. L. Kier & Co.

S.E. Area Price Increase

Electricity charges in South East England will be higher from 1st June. Announcing this, the chairman of the South Eastern Electricity Board, Mr. Norman Elliott, says that higher costs beyond the Board's control have compelled it to end the "price freeze" which has been maintained for the past eighteen months. Partly because of dearer coal, the Central Electricity Authority's charges for bulk supplies of electricity to the Board have been increased; wage bills are higher and the Board will be required to pay more for local rates. The total extra cost will be about £1½ million a year. Further economies and greater productivity by Seeboard will provide a substantial contribution but this alone will not be enough. To bridge the remaining gap, published rates for domestic and commercial consumers will be increased by about 1s 6d in the £.

Flat rates for lighting and for cooking, heating and power will not be increased, nor will the off-peak charges. Domestic quarterly charges will be raised by 2s 6d and the "unit" rate of the domestic tariff and of all business and commercial two-part and block tariffs will go up from 1·1d to 1·2d. The higher "unit" rate will apply to two of the four standard tariffs announced last month which on 1st April, 1958, will replace existing business and commercial tariffs. These are the installed load and farm tariffs. The church and community halls tariff and measured demand tariff will remain unchanged.

Savings made by Seeboard during the past seven years—worth over £6½ million—have cushioned the impact on consumers of dearer bulk supply charges and power station coal. In this period the Board's own distribution costs have been reduced by nearly a quarter.



Lt.-Col. A. E. Knights, Fens sub-area manager, Eastern Electricity Board, speaking at the opening of the new Huntingdon service centre. On his right are Mr. David Renton and Mr. C. T. Melling, chairman of the Board

Northfleet Power Station Contract

A contract worth over £1 million for constructional work at Northfleet power station, near Gravesend, has been awarded by the Central Electricity Authority to Taylor Woodrow Construction, Ltd., who are already carrying out the river works, main foundations and stores and administration blocks. This contract, which brings the value of the company's work at Northfleet to over £3½ million, entails the construction of the superstructure required in connection with the installation of six 120 MW turbo-alternator sets and their associated boiler plant, together with the circulating water pumphouse and other ancillary works. The consulting engineers are L. G. Mouchel & Partners, Ltd.

Cross-Channel Cable Route

It is reported that the English terminal of the proposed cross-Channel power cable is being moved from Shakespeare Cliff, Dover, where the experimental cable was laid, to a point two or three miles to the westward, increasing the total length from 26 to 31 miles. In the House of Lords last week the Minister of Power (Lord Mills) stated that the Government hoped to make an announcement about the project shortly.

New Huntingdon Service Centre

A new service centre in High Street, Huntingdon, was opened by Mr. David Renton, Parliamentary Secretary to the Minister of Power, on 27th April. Supporting Mr. Renton were the Mayors of Huntingdon and Godmanchester, Lord de Ramsey, and the chairman and deputy chairman of the Eastern Electricity Board, Mr. C. T. Melling and Mr. H. D. B. Wood.

The premises were previously used as a shop and provide adequate accommodation for the office staff at the rear. Mr. J. W. Lee, A.R.I.B.A., the Board's architect, produced plans for the service centre which could be carried out with the minimum of structural alterations. The old timber floor of the shop was removed and replaced by concrete and this facilitated the installation of electric floor warming. Electric storage heaters, the prototypes of which were largely developed by Board officers, have been used to heat the remainder of the building and the offices. The contractor was Mr. F. B. Thackray of Huntingdon.

Before unveiling a plaque on the wall of the service centre commemorating the official opening, Mr. Renton said it was pleasing to see that an old building had been so well adapted to modern requirements instead of being scrapped.

Oil-Filled Cables for 275 kV Supergrid

Pirelli-General Cable Works, Ltd., has been awarded a contract worth approximately £100,000 for the manufacture and installation of four circuits totalling some 5,721 yd of 0·4 sq in single-core copper conductor 275 kV oil-filled cable at Drakelow power station. The cables will run between the outdoor type sealing ends at transformers and outdoor sealing ends in the switching station.

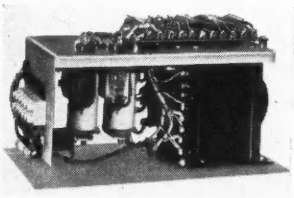
Scottish Nuclear Station Delay

Last week we reported that because of illness Sir Randall Philip, Q.C., the Commissioner appointed by the Secretary of State for Scotland to inquire into the proposal of the South of Scotland Electricity Board to erect a nuclear power station at Hunterston, Ayrshire, had been unable to complete his report. Sir Randall Philip died on 2nd May. A Scottish correspondent informs us that so far it has not been indicated how the Secretary of State for Scotland will overcome the difficulty. He also says that if the Hunterston scheme is substantially delayed the South of Scotland Board may decide to proceed with an emergency programme to complete the second half of its new Kincardine power station.

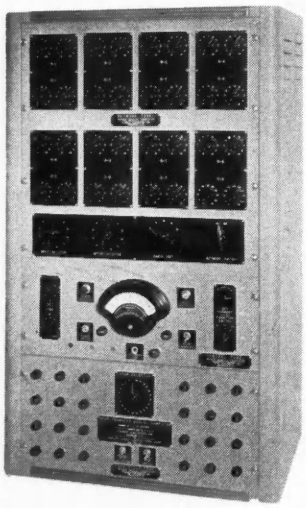
NEW ELECTRICAL EQUIPMENT

Westool heavy duty faceplate winder

Dawe ultrasonic cleaning equipment



Claude Lyons miniature automatic tap changing transformer



Cable heat transfer analogue computer

Automatic Tap Changing Transformers

CLAUDE LYONS, LTD., Valley Works, Ware Road, Hoddesdon, Herts, announce the introduction of a new miniature electronic tap-changing transformer designed to ensure that the output voltage remains within ±5 per cent of the declared value for input changes of as much as −20 per cent to +10 per cent. The transformer is made in two basic sizes rated at 2½ and 5 A when the voltage is 200/250. For 100/125 V models the current rating is double, i.e. 5 and 10 A.

Computer for Cable Problems

An analogue computer designed for application to heat transfer problems in electric cables is now being manufactured by the ADDISON ELECTRIC CO., LTD., 10-12, Bosworth Road, London, W.10. It is based on the design of J. H. Weher in association with Lynmer Engineers' Inc. In this the thermal constants of the cable and its surroundings are represented by the electrical constants of a resistance-capacitance network. These and the required load conditions are set up by means of front panel controls. The load conditions can be in the form of a complete 24-hour load cycle. The thermal behaviour is then studied at selected points and times by the aid of a valve voltmeter, whereby the hour of actual time normally corresponds to the second of computing time.

The new instrument can be used to determine short-time emergency ratings and the proportion of ultimate temperature rise after a given time with constant loads for various cable systems; the effect of load and maximum temperature rise which will occur during a given cyclically applied loss cycle in various cable systems; and oil flow problems and the temperature rise at various points in cable systems as a function of time.

Faceplate Coil Winder

The latest addition to the range of coil winders manufactured by WESTOOL, LTD., St. Helens, Auckland, Co. Durham, is a heavy duty faceplate winder. Designed for the winding of coils used in lifting magnets and transformers, the machine is provided with a 30in faceplate which is slotted to enable coil formers to be clamped to it. It is capable of winding coils of up to 28in in diameter with a maximum width of 6in. Wires which can be used range from 10 to 30 s.w.g.

The winder has a gear box giving four speed ranges up to 415 r.p.m. and the gear changing is carried out by the rotation of a spider hand wheel. There is an infinitely variable ratio within the limits of the machine of the turns per layer with a calibrated scale for setting.

The reel carrier, mounted as an integral part of the machine, is capable of carrying reels of up to 15in in diameter and has adjustable tensioning facilities.

The winder has a 2 b.h.p. induction motor and Warner electromagnetic clutches and brakes are incorporated in the drive. These ensure smooth acceleration and deceleration and variable braking from a smooth cushioning effect to an instantaneous stop.

Ultrasonic Cleaning Bath

In the Type 413 cleaning equipment just introduced by DAWE INSTRUMENTS, LTD., 99, Uxbridge Road, London, W.5, ultrasonic energy injected into a bath induces cavitation on the surface of any object immersed in it. The constant generation and collapse of a multitude of bubbles has an intense cleaning effect which removes all contaminants from the surface without damaging it in any way.

Each generator provides power at 38 kc/s, sufficient for transducers having a total area of 30-40 sq in. This area is ample for a standard 1 gal tank or two ½ gal tanks, each tank having a transducer built into the base.

Cleaning at temperatures from 100 to 160 deg F gives the best results in most cases. The transducers can, however, be operated in liquids at up to 170 deg F. Ordinary dirt can be removed in a matter of seconds, while grease rubbed well down between the teeth of a file is cleaned out completely after immersion for about 30 sec.

The generator can be utilised for experimentation in such fields as plating, soldering, quenching, pickling, dyeing, emulsifying, metal melting and casting.

Industrial X-Ray Equipment

The latest addition to the Newton Victor range of industrial X-ray equipments is the "Raymax 150." It has been designed to meet the demand for a lightweight radiographic equipment suitable for use in the factory or on open erection sites.

Manufactured by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17, it is the first gas insulated X-ray equipment designed and produced in Great Britain. The use of non-toxic inert gas—sulphur hexafluoride—as the

Newton Victor "Raymax 150" gas insulated X-ray equipment

insulating medium, together with the absence of high voltage cables, rectifying valves and the associated filament transformer, has resulted in a unit of low weight and exceptionally rugged construction. The equipment consists of a tubehead, gantry stand, control unit and water cooler.

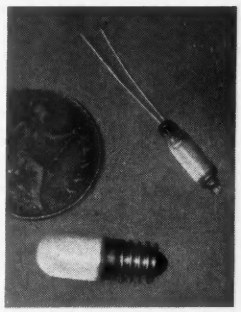
The tubehead comprises a high voltage transformer, a filament transformer and an X-ray tube all housed in a cylindrical steel tank 18in in diameter, 36in long, filled with sulphur hexafluoride at a pressure of 20 lb/sq in. The target of the X-ray tube is earthed and is water cooled, either directly from the mains supply or from a simple water/air heat exchanger.

The gantry stand provides a versatile support for the tubehead with a vertical travel of 48in. Pivots on the long and short tubehead axes permit the beam to be angled in all directions, e.g. the horizontal beam can be adjusted from floor level up to a height of 9ft 4in. The horizontal traverse of the tubehead is 16in. For special work the tubehead and cradle can be easily removed from the stand. Two tubes are available for use with the equipment.

The small portable control has been designed for wall or desk mounting in permanent installations and is of a convenient shape and size for site work. The continuously adjustable tube voltage has a range from 50 to 150 kVp, sufficient for all light alloy castings, plastic mouldings or assemblies, and welded steel plate up to 1½in thick.

Fluorescent Indicator Lamp

The first miniature fluorescent indicator lamp produced in this country in colour is now being marketed by HIVAC, LTD., Stonefield Way, South Ruislip. The lamp has been designed to satisfy the demand for an alternative colour to the standard neon. These lamps, which are now being produced in green, have negligible power consumption and

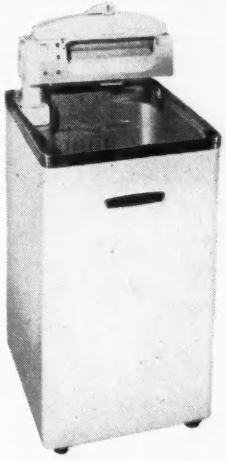


Hivac miniature fluorescent lamps

numerous applications in industry and the domestic appliance field. They are independent of transformer windings or special l.v. supplies and can be run continuously, or rapidly flashed, without risk of sudden failure.

Washing Machine

A new electric washing machine, with a tub constructed of polyester glass fibre, has just been placed on the market by VACTRIC, LTD., 196, Sloane Street, London, W.1. The use of glass fibre for the tub construction has



Vactric washing machine

enabled the manufacturers to achieve a larger tub than is normally used in a machine of this size. The actual dimensions of the washing machine are 36in high by 20in wide by 22in deep.

Other advantages are that a 12in "Acme" power wringer can be folded away completely inside it; the water is claimed to maintain its temperature for a longer period than with a metal tub; and as it has no seams, welds or corners rusting, warpage or leakage are avoided.

The cabinet has extremely clean lines, the controls being situated within the machine, with the exception of the main control switch which is recessed in the side of the machine. The cable stows away inside the cabinet and there is a special housing to conceal the plug. It is a fully heated model having two 1,500 W thermostatically controlled elements which can be used together for quick heating of water or singly to maintain water temperatures. The agitator is made of a highly durable plastic and as the clothes never come into contact with metal the risk of possible damage is reduced.

The machine has a capacity of 9 lb dry weight in 10 gal of water and can be emptied by its powerful pump and concealed emptying hose in 2½ min approx. The wringer has eight positions and can be used for wringing one batch of clothes whilst another is in the washing process. Its table top lid can also be used as a carrying tray when inverted. The machine is mounted on ball bearing castors with plastic wheels and is easily manœuvrable whether filled or empty. The finish is in cream or white and the tub interior pastel green. It is guaranteed for two years and the price is £56 17s plus £21 18s purchase tax in the United Kingdom.

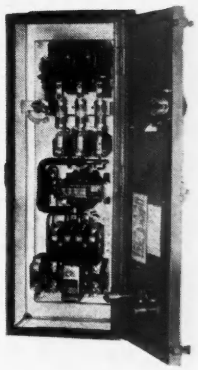
Combination Starters

New combination starters are now being manufactured in Britain by SQUARE D, LTD., 100, Aldersgate Street, London, E.C.1.

They consist of a Class 8536 line voltage magnetic starter with a new interlocking load-break disconnect switch housed in a single unit. The disconnect switch, which can be fused if desired, is horse-power rated and mechanically actuated by means of a handle on the enclosure cover. To prevent accidental switching on of a machine controlled by the starter, the switch handle can be separately locked by four padlocks at any one time. The switch has heavy silver plated visible blades for quick-make-and-break with magnetic blow-out arc chutes. It will repeatedly interrupt a stalled motor load.

The starters are housed in a dust-tight and oil-resisting enclosure. Overload protection on the starter is provided by melting alloy thermal overload relays with an inverse time characteristic. Fusible models are easily converted from English h.r.c. fuses to Canadian-American fuses. A low voltage control circuit transformer is available as a standard accessory.

Square D combination starter, Class 8536



INDUSTRIAL NEWS

Cable Makers' Wages Increases

The Joint Industrial Council for the Electrical Cable Making Industry has agreed to increases in wages which became effective as from the beginning of the first full pay period following 1st May. The timeworkers' rates have been increased by 2½d an hour, or 9s 2d for a 44-hour week, in respect of adult males, and by 2¼d an hour, or 8s 3d for a 44-hour week, in respect of adult females. Proportionate increases are made, ranging from 1¼d to 2½d an hour for males and 1¼d to 1½d for females below adult age.

Plumber jointers have received an increase of 2¾d an hour from the beginning of the first full pay period following 3rd May, with consequential increases in the rates of pay of plumber jointers' mates, learners and probationers, and of youths and boys. Plumber jointers will receive an additional 2d per hour when they are engaged on the jointing of cables of 33 kV and above.

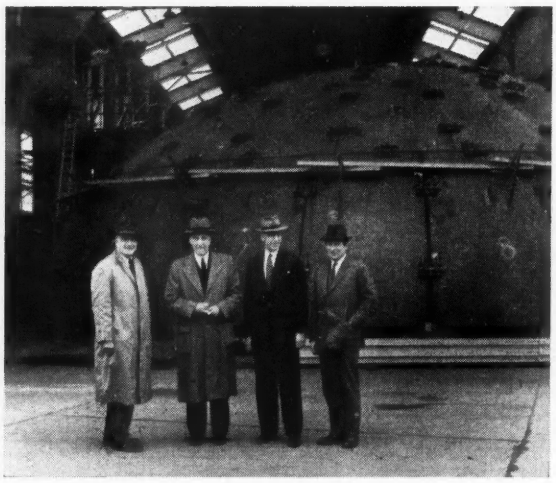
Reactor Vessel for Berkeley

Sir Josiah Eccles, deputy chairman (operations) of the Central Electricity Authority, saw the progress being made on the manufacture of parts for the Authority's Berkeley, Glos., nuclear station, which is being built by the A.E.I.–John Thompson Nuclear Energy Co., Ltd., when he visited the John Thompson Wolverhampton works on 18th April. The massive 3in thick steel dome which forms the bottom of one of the 1,000-ton reactor vessels was almost completely fitted together on a huge jig before transportation in sections to the power station site, where it will be welded.

When completed, the reactor vessel will be 50ft in diameter and 80ft high, mounted on rockers to allow for expansion during operation. Each piece of the vessel is pressed to shape and prepared for welding before leaving Wolverhampton.

Also now in active production at the company's Wolverhampton works are some of the big heat-exchange units which will contain 150 miles of pipework and tubes to convert the heat from the reactor into steam. One of the intricate fuel-loading machines is taking shape and much of the steel thermal shielding which will surround the reactor vessels is complete in sections ready for welding preparation.

At the John Thompson works, Wolverhampton. Left to right: Mr. E. W. Thompson, chairman, John Thompson, Ltd.; Sir Josiah Eccles, deputy chairman, Central Electricity Authority; Mr. H. West, managing director, A.E.I.–John Thompson Nuclear Energy Co., Ltd.; and Mr. J. H. N. Thompson, deputy chairman, John Thompson, Ltd. In the background is the dome which, when inverted, will form the bottom of the reactor vessel for Berkeley



Gauge and Tool Display at B.I.F.

The Gauge and Tool Makers' Association stand (C.413/312) at the British Industries Fair, Castle Bromwich, this year occupies an island site of 1,000 sq ft and 42 of the 337 firms in the Association are displaying a range of manufactures and sales literature in individual showcases on the composite exhibit. The classes of engineering products displayed include gauges and measuring equipment, jigs, fixtures and special tools, special purpose machinery, engineers' small tools, press tools, moulds, dies, diamond tools, testing machinery, etc.

British Trade Fair, Helsinki

At a Press conference in Helsinki on 29th April Sir Norman Kipping, Director-General of the Federation of British Industries, and Mr. W. P. N. Edwards, a director of the F.B.I. and of British Overseas Fairs, Ltd., gave details of the plans which are now being completed for the British Trade Fair and Exhibition to be held at Helsinki from 6th to 22nd September under the joint patronage of Queen Elizabeth and the President of Finland.

The exhibition is being organised by the Federation of British Industries through its subsidiary, British Overseas Fairs, Ltd., in association with the Finnish-British Trade Association and the London Chamber of Commerce. More than 500 British manufacturers, in co-operation with their agents in Finland, will be exhibiting their products in Helsinki's exhibition building, the Messuhalli, and its adjoining open space, the Messukennta. The exhibits inside the hall will consist of machinery, tools, general engineering products, instruments, chemicals, textiles, office machinery and consumer goods, all shown by leading manufacturers. In the open space there will be exceptionally representative displays of motor vehicles, agricultural machinery, contractors' plant and earth-moving equipment. To mark the occasion of the exhibition the Finnish licensing authorities are making available import licences to the value of £1,000,000.

A special farm feature will demonstrate the methods and equipment used by British farmers to-day. The Lord Mayor of London will open the exhibition.

Light Electrical Engineering Inspection

The April "Broadsheet" of the City and Guilds of London Institute mentions that following the successful operation of the Institute's mechanical engineering inspection scheme introduced in 1954 a scheme has now been developed for inspection in light electrical engineering. There are five sections, as follows:— A. — General introduction; B.—Electronics and telecommunications (common portion); C.—Line telegraphy and telephony; D.—Radio; and E.—Radar.

The course is designed to follow that for the Ordinary National Certificate in Electrical Engineering, or certain portions of the City and Guilds scheme in telecommunications engineering. Sections A and B must be taken before proceeding to Sections C or D and those intending to take Section E must previously pass in Sections A, B and D. Entry to the examinations is open only to candidates who have followed a course of instruction; the first examinations in A and B will be offered this year.

Commercial Travellers' Benevolent Institution

The half-yearly Court of Governors of the Commercial Travellers' Benevolent Institution will be held on 15th June (12 noon) at the Berners Hotel, Berners Street, W.1.

Post Office Radio Services Course

A course on point-to-point radio services, arranged by the British Council with the assistance of the Post Office Engineering Department, commenced in London on 29th April and will continue until 14th May. The

course, in which twelve senior engineers and university lecturers from Australia, Finland, Italy, the Netherlands, Norway, Pakistan and Sweden are taking part, is designed to explain the principles and techniques used in the internal and overseas radio communications of the United Kingdom. Senior Post Office engineers are delivering lectures covering subjects from low frequency long-distance radio communications to super high frequency multi-channel telephone and television links. The course includes visits to a number of Post Office establishments and manufacturers' works.

The Electronic Office

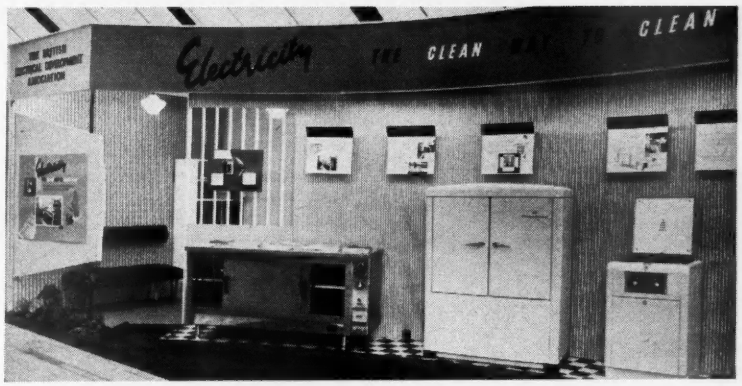
The National Conference of the Office Management Association will be held at Scarborough from 16th to 19th May. The theme of the conference will be "The Electronic Office," and in conjunction with the conference there will be a display of literature and photographs relating to the theme arranged by a number of companies. Particulars of the conference can be obtained from the secretary of the Association, 58, Victoria Street, London, S.W.1.

Y.E.B. Staff Conferences

Last month the Yorkshire Electricity Board held four two-day staff conferences at Leeds University organised on a departmental basis under the control of the appropriate chief officer. The conferences covered engineering, accountancy, secretarial and commercial subjects, each being attended by about fifty delegates from the department concerned.

New Anglo-American Company

A new company to manufacture transistors and other semi-conductors in England, known as Semiconductors, Ltd., has been formed by the Plessey Co., Ltd., and Philco Corporation of U.S.A. The new company will have an initial paid-up capital of £500,000, of which 51 per cent will be held by the Plessey Co. and the remaining 49 per cent by Philco Corporation. The joint board of directors will be as follows: Messrs. A. G. Clark (chairman), J. M. Skinner, Jnr., J. F. Mallabar, L. J. Woods, A. E. Underwood and P. Marriage. It is anticipated that production of transistors manufactured under Philco patents covering a wide range of applications in the industrial and consumer fields, will begin early in 1958. Automatic equipment designed and manufactured by Philco Corporation will be used for the mass production of transistors, similar to equipment installed in Philco's new transistor plant at Spring City, Pennsylvania. Philco Corporation and Philco (Overseas), Ltd., will support the new organisation with design information. Production of transistors in England is expected to follow a similar pattern to the transistors developed in Philco's Research Laboratories in the United States. These will include high frequency germanium and silicon transistors for military, industrial and commercial applications produced by the electrochemical process.



The stand of the British Electrical Development Association at the recent Health Exhibition at Folkestone. The theme of the display was "Electricity—the Clean Way to Clean Food"

Cable and Flexible Cord Prices

The Rubber and Thermoplastic Cable Manufacturers' Association has issued its minimum trade price list No. 1 which sets out the new minimum trade prices of its members for rubber and thermoplastic insulated wires, cables and flexible cords which came into force on 29th April.

Drainage Pumps for Kariba Station

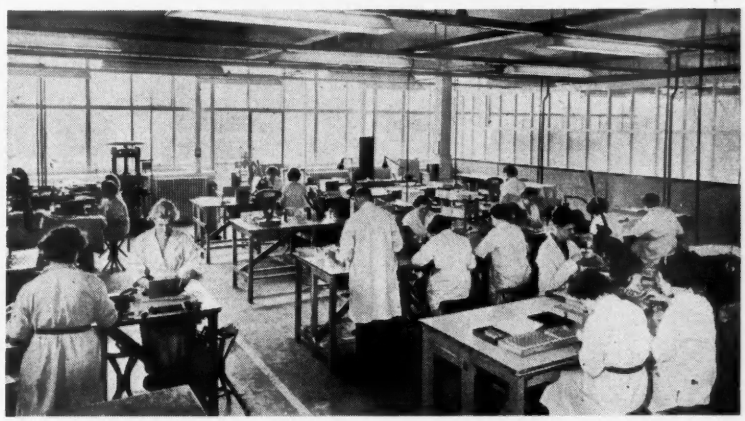
Rhodes, Brydon & Youatt, Ltd., have received an order from Boving & Co., Ltd., for the supply of seven vertical motor driven drainage pumps for installation in the power station in Kariba Gorge. Three power station drainage sumps are to be provided and these will be equipped with four three-stage vertical "Mopumps." The pumps will run at 1,450 r.p.m. and will deliver 200 g.p.m. of water against a maximum head of 130ft or a minimum of 83ft, each being fitted with a 17½ h.p. driving motor, mounted on the headpiece above the supporting steelwork.

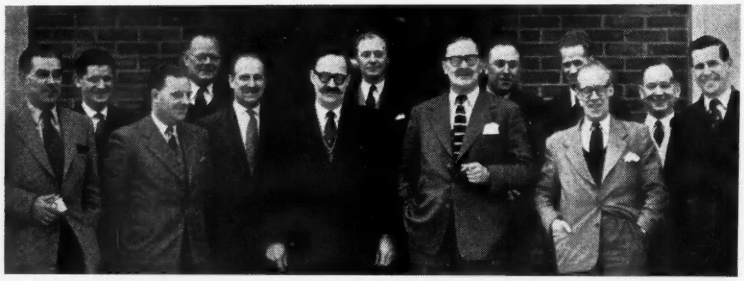
To facilitate periodic inspection of the turbine casings and draft tubes an elaborate layout of piping and valves has been arranged embedded in the foundations of the power station. To this pipe system will be attached two 9in vertical "Mopumps." Each of these will be capable of de-watering the turbine casings and draft tubes at 2,000 g.p.m. against a total head of approximately 80ft. A larger pump of similar design to the 9in pump is being provided for the purpose of de-watering the tail-race tunnel. This will be a 14in v.h. vertical "Mopump" capable of delivering 4,000 g.p.m. of water against a total head of 85ft at 950 r.p.m. and will be driven by a 170 b.h.p. motor.

Venner Accumulators' Expansion

To meet the increasing demand for lightweight silver-zinc batteries, Venner Accumulators, Ltd., formerly occupying a section of the main Venner Kingston By-Pass frontage, is now installed in a newly constructed, self-contained, building situated behind the main factory, taking over the whole of the top floor comprising 6,000 sq ft of unobstructed working

Part of the new premises of Venner Accumulators, Ltd.





Senior executives and directors at the annual sales conference of Dimplex, Ltd.

space. The new building is a steel-framed structure with reinforced concrete floors and hollow brick external walls which have large expanses of glass allowing for maximum daylight. Power for machinery is supplied by equi-spaced ceiling-mounted busbar lines, and lighting is provided by continuous trough-type fluorescent fittings.

Electric Winders for the N.C.B.

The Metropolitan-Vickers Electrical Co., Ltd., has recently received an order from the National Coal Board for two four-rope tower-mounted friction winders for Bevercotes Colliery (East Midlands Division). This order, which is worth about £170,000, brings the total number of friction winders ordered from M-V since the war up to seventeen. The order covers a 2,384 h.p. cage winder for No. 1 shaft and a 3,466 h.p. skip winder for No. 2 shaft. They will be d.c. Ward-Leonard equipments similar to those at Rufford.

Scottish Board's Novel Publicity

In an attempt to break away from the conventional and stereotyped cookery demonstration, the South of Scotland Electricity Board has been making some novel experiments, using the "dramatic approach." The aim has been to devise first-class entertainment which nevertheless introduces at some stage electrical propaganda. An excellent example of this new technique is a specially written one-act play, "A Licht Wi' Burns," which has been presented in several towns, and the demonstration, instead of being the central point of interest, has been woven into the action of the play. This was originally prepared to link-up with the electricity "switch-on" at Ellisland farm, near Dumfries, where Robert Burns set up house with his Bonnie Jean.

Birlec in India

In future Birlec interests in India will be handled by A.E.I. (India), Ltd., with headquarters in Calcutta. This has been decided after a visit to India by Mr. G. P. Tinker, managing director of Birlec, Ltd., with the object of reviewing agency arrangements in this rapidly growing market.

Dimplex Sales Conference

Area sales managers from all parts of the country attended the annual national sales conference of Dimplex, Ltd., at its new offices and works at Millbrook, Southampton. The conference opened on 23rd April and concluded on 27th April. Opening the conference, Mr. E. J. Wade, managing director, said that in spite of a most unseasonable winter, the company had had the best trading heating season ever. The various conference sessions dealing with every aspect of the company's commercial development and manufacturing programme for the ensuing twelve months, were attended by all senior executives of the head office staff. Mr. H. R. Heath, director and secretary, presided throughout. Mr. D. N. Dale, advertising and sales promotion manager, reviewed the sales drives made at home last winter and similar campaigns undertaken in the United States, in France and in Holland. He announced that the 1957-58 winter advertising campaign would be stepped up considerably. The conference dinner was held at the Vine Hotel in the New Forest.

A scene from "A Licht Wi' Burns," presented by the South of Scotland Electricity Board

Yorkshire Switchgear Jubilee

The jubilee of the Yorkshire Switchgear & Engineering Co., Ltd., was celebrated recently when all members of the works and staff, numbering over 800, attended a buffet-dance at which a birthday cake weighing 143 lb was cut by Mrs. G. Caton, wife of the managing director. A toast to the company was proposed by Mr. F. Steel, works manager, who has been with the company for over 41 years.

The business was founded by Messrs. W. H. Turner and W. H. Isherwood in 1907 with the name of Tramway Supplies, Ltd., the title being changed to its present form in 1925. The original purpose of the company was to manufacture the electrical equipment associated with tramways systems, but gradually a more general trend became evident and from 1914 onwards numerous items of distribution equipment were developed which laid the foundation for the present business as switchgear specialists. Between the wars new equipment introduced included an electrode boiler, a cable stripping machine, illuminated street refuge bollards, porcelain base line service fuse fittings and many other fittings. Mr. G. Caton, the present managing director, joined the company in 1938 as technical director. An associated company—Electrode Mechanical-Manufacturing Co.—was formed in 1943 to manufacture several Y.S.E. products. In 1947 Mr. Caton became managing director following the death of Mr. Turner.

New Electronics Laboratories

The new research laboratories of Ekco Electronics, Ltd., at Southend-on-Sea, Essex, were officially opened on Friday last, 3rd May, by Lord Salisbury, K.G., P.C. This new four-storey building has been erected to keep abreast of the company's rapidly expanding activities in the electronic field. The building will provide the development and engineering division with an additional 31,600 sq ft of working floor area.

Trade Announcements

A new company, to be known as **Klockner Moeller England, Ltd.**, has been formed to market in the United Kingdom electrical control gear manu-

factured by Klockner Moeller, Bonn. The present offices are at 4, Queen Street, Mayfair, London, W.1, and Prince's Buildings, 28, Oxford Street, Manchester. New premises for the London office are being arranged. The managing director of the company is Mr. H. M. Passer.

Following the acquisition of the controlling interest in the Hartley-Baird Group by Camp Bird, the London office of **Ambassador Radio & Television** has been transferred to Camp Bird House, Dover Street, W.

All ELA (electro-acoustic) amplifier outside service previously handled by the head office of **Philips Electrical, Ltd.,** Century House, has been taken over by the company's main service department at Waddon Factory Estate, Purley Way, Croydon (telephone: Croydon 7722, extension 11).

Mr. J. E. Salisbury has joined the **British Central Electrical Co., Ltd.,** as a sales engineer in the Plant and Sales Department. He was previously with the Simplex Electric Co.

Honeywell - Brown, Ltd., have opened a new branch office at 5-7, New York Road, Leeds, 2.

The headquarters of the Liverpool Spares and Service Department of the **English Electric Co.'s** Appliance and Television Division is now at East Lancashire Road, Aintree, Liverpool (telephone: Aintree 7241).

Mr. Gabriel Bergman, who recently retired from the position of chief purchasing officer of the Ministry of Works, has formed a company operating as **G. Bergman & Co.,** manufacturers' agents, at 107, High Street, Croydon (telephone: 9248). Mr. Bergman is representing Herman Smith, Smithlite, Ltd., lighting fittings manufacturers, in Sussex, Surrey and Kent, and part of Middlesex.

Aerialite, Ltd., has transferred its Newcastle-on-Tyne depot to larger premises at Stepney Bank, Newcastle-on-Tyne, 1 (telephone: Newcastle 26805).

Advertisement Correction

Scemco ask us to state that in their advertisement in page 108 of last week's issue they inadvertently gave the rating of their circular fluorescent lighting fitting as 50 W. It is actually 80 W.

Building Aggregate from Fly Ash

LAST week Lord Mills, Minister of Power, officially inaugurated a new experimental plant which has been erected on the Battersea (London) power station site for the Cementation Co., Ltd., for the production of "Terlite." This material is a new lightweight aggregate, which combines lightness with strength and is therefore of outstanding interest to the building industry. Confidence is felt that the results at Battersea will confirm small-scale research, and that the venture will make a major impact on building construction in this country, and also relieve the electricity supply industry of a growing embarrassment, namely, the disposal of its fly ash from pulverised fuel fired power stations.

The cost to the Central Electricity Authority of dispersing this ash ranges up to £1 a ton or more and averages 5s a ton. There is also the problem of finding somewhere to dump the ash.

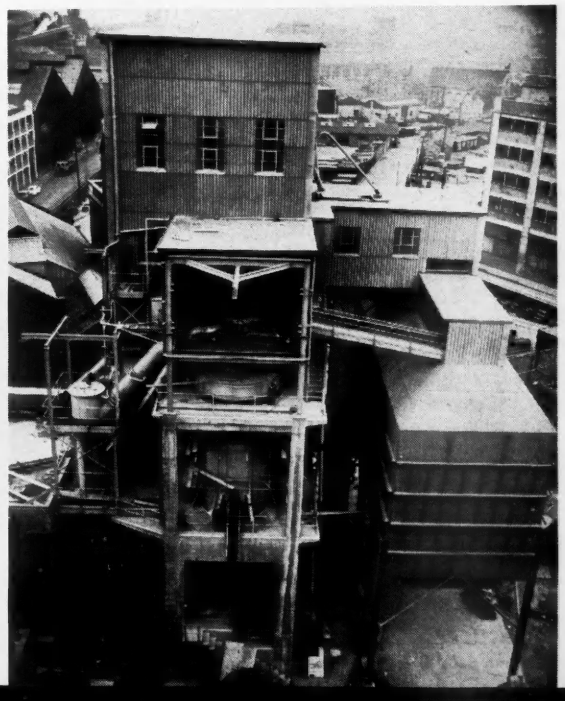
About two years ago, in collaboration with the C.E.A., the company decided to have erected by Sinterlite, Ltd., the full-scale research plant at Battersea power station. By agreement with the Authority, the company is bearing the cost of the main plant (about £260,000) and the C.E.A. the cost of the p.f. ash delivery system and the exhaust gas system (believed to be about £100,000).

The sintering plant itself is fairly simple in principle. Its heart is the kiln, one to each of the dual units, measuring about 40ft high by 10ft in diameter, of welded steel plate lined with refractory bricks. Each kiln has an annual capacity of some 50,000 tons of "Terlite." The ash, from the power station's electrostatic precipitators, is first delivered into bunkers from which it is fed into a shallow circular pelletiser, revolving at an angle, where it is sprayed with water. In the revolving pelletiser, gravity and centrifugal force cause the damp ash to form into small balls, the size being determined and regulated by the speed and the tilt of the pelletiser. The pellets spill over the rim of the pelletiser tray into a conveyor *en route* to the kiln.

As there is enough carbon in the p.f. ash to support combustion, no fuel is needed other than that required to kindle the fire at the start. In the process, not only is all the carbon driven off, but also any sulphur and other volatile compounds, rendering the final product completely inert.

The process is continuous, the pellets slowly descending from the top of the kiln until they reach the revolving grate at the base. Through suitably shaped apertures in this grate, which is designed also to break up the larger clusters, the sintered pellets emerge to be screened, graded into sizes and stored in hoppers.

Lord Mills, accompanied by the two deputy chairmen of the C.E.A., Sir Henry Self and Sir Josiah Eccles, and others, opens the new building aggregate plant at Battersea power station



Financial Section

STOCKS and SHARES

FIRST dealings in the English Electric company's issue of three million new ordinary shares took place at the beginning of this week in favourable circumstances, the Stock Exchange being busy and cheerful in most sections. General firmness was assisted by a strengthening of prices in the gilt-edged market, where a new Government financing operation was interpreted by some as bringing nearer the prospect of a second step down in Bank Rate. Industrials registered relief over the easing of tension in those fields of foreign and domestic affairs which have lately been causing the most anxiety. Some good company news helped towards a further all-round improvement in security prices.

English Electric New Shares

Offered to the company's shareholders at 50s, the new English Electric £1 ordinary shares opened at a premium of 9s 9d, which had expanded to 11s 6d by the end of the first day's dealings. For the present they can be bought for the amount of the premium, subject to the payment of calls of 20s per share by 28th May and the remaining 30s by 9th July. Until then they are transferable free of the 2 per cent stamp duty which is payable in the usual way by a buyer of industrial shares. Regarding dividend prospects, the company anticipates the maintenance of the present 14 per cent dividend rate for the current year, unless trading conditions undergo a serious change. To a buyer of the shares at an all-in price of 61s 6d, there is consequently a yield of a fraction over 4½ per cent in prospect. In view of the size of the premium on the issue price, existing stockholders will evidently do well to note the invitation to apply for shares in excess of the number provisionally allotted to them.

Better Prices

Although dominated by the activity in the English Electric issue, the market in the shares of the other big electrical and atomic power groups continued quietly to move forward, A.E.I. and G.E.C. both gaining a further shilling or so. Among the engineering shares, the feature was again Clarke Chapman, which reached 170s and now stand more than £2 above the price ruling at the beginning of this year. International Combustion rose further to 30s. Elsewhere, Plessey were outstanding with a jump of 6s 3d to 84s 9d. Radio shares in general were helped by trade reports confirming a substantial revival of business in the first quarter of the year. Thorn Electrical and Ever Ready were particularly good, rising about 3s apiece. Gains of 1s or more in Desoutter, Elliott Brothers and Brook Motors were among other numerous improvements in the electrical lists. Anglo-Portuguese Telephone were again singled out as likely to benefit from the tax reliefs to companies operating abroad.

Simon-Carves Results

Annual results and the final dividend declaration from Simon-Carves, part-

Price Changes in

Company or Board	Nom. Value	Middle price 6th May	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	77½		3	3	3 17 6	80	75
Brit. Elec. 1974/77	100	75½		3	3	3 19 6	78½	73½
Brit. Elec. 1976/79	100	79½	+1	3½	3½	4 8 0	81½	77½
Brit. Elec. 1974/79	100	90½	+1	4¼	4¼	4 14 0	92½	87¼
Overseas Electric Supply								
Calcutta Elec.	£1	19/-	+1/-	6†	6†	6 6 3†	19/-	18/3
East African Power	£1	21/-		7	7	6 13 3	21/-	19/3
Nigerian Elec.	£1	17/6		10	10*	11 8 6	18/6	17/3
Perak Hydro-Elec.	£1	17/-	+6d	10	10*	11 15 3	17/-	13/3
Electrical Shares								
Aberdare Cables	5/-	12/6		17½	17½	7 0 0	12/6	9/9
Aerialite	1/-	5/9		45	48	8 6 9	6/-	4/9
Allen, W. H.	£1	44/6	+2/-	20	10*	4 10 0	44/6	33/6
Anglo-Portuguese Tel.	£1	27/6	+1/9	8	8	5 16 6	27/6	20/6
Aron Elec. Ord.	£1	56/3		15	15	5 6 9	56/3	53/6
Assd. Automation	10/-	23/3		10	5	2 3 0	23/3	17/9
Assoc. Elec. Ord.	£1	68/9	+1/3	15	15	4 7 3	73/-	62/6
Automatic Tel. & El.	£1	67/6		15	17	5 0 9	68/9	54/6
Babcock & Wilcox	£1	76/3xd		15	15	3 18 9	82/6	71/6
Bakelite	10/-	24/6		16	15	6 2 6	24/6	20/9
Baldwin, H. J.	2/-	4/3		20	20	9 8 3	5/-	4/-
Berry's Electric	5/-	6/3	+6d	—	10‡	8 0 0	6/3	5/6
British Aluminium	£1	71/3	+1/3	12	12	3 7 6	71/3	63/9
Brit. Elec. Traction: Def. Ord. "A"	5/-	22/3	+9d	22½	22½	5 1 3	22/3	17/-
B.I. Callender's	£1	54/9	−3d	12½	12½	4 11 3	55/-	48/3
B.I. Callender's 6% Pref.	£1	21/-	−6d	6	6	5 14 3	21/9	20/6
British Tabulating	£1	55/-	+1/6	9	9	3 5 6	55/-	42/-
British Thermostat	5/-	27/-		20	25	4 12 6	27/6	25/9
British Vac. Cleaner	5/-	6/3	−1/9	15	10	8 0 0	8/-	6/6
Brook Motors	10/-	33/9	+1/3	25	25	7 8 3	33/9	30/-
Brush Group	5/-	8/-	+1/-	10	Nil	—	8/-	4/6
Bulgin, A. F.	1/-	5/-		50	40*	8 0 0	5/6	4/6
Burco Dean	5/-	13/-	+1/-	22½	20	7 13 9	13/-	8/9
Cable & Wireless: Ord.	5/-	11/6		10	10	4 7 0	12/-	9/6
4% Loan	100	92½		4	4	4 6 6	92½	89
Chloride El. Storage "A"	£1	67/6xd		17½	17½	5 3 9	68/3	58/-
Clarke Chapman	£1	170/-	+7/6	22½	27½	3 4 9	8½	6¼
Cole, E. K.	5/-	21/9	+1/3	17½	17½	4 0 6	21/9	16/6
Cossor, A. C.	5/-	6/6		15	Nil	Nil	7/3	5/9
Crabtree	10/-	25/6		20	20	7 16 9	25/6	23/3
Crompton Parkinson Ord.	5/-	16/6	+3d	16	16	4 17 0	17/9	14/6
De La Rue	5/-	19/3	−3d	30	30	7 15 9	19/9	16/3
Decca "A"	4/-	28/9	+6d	43¾	43¾	6 1 9	32/3	27/-
Desoutter	5/-	33/6	+1/6	30	32½	4 17 0	33/6	27/6
Dewhurst	2/-	7/-		30	16¼*	4 12 9	7/6	5/9
Dictograph Tel.	2/-	7/6		20	20	5 6 9	7/6	6/9
Dubilier Condenser	1/-	5/6		25	30	5 9 0	5/9	5/6
Duport	5/-	18/6		23	25	6 15 3	19/6	17/6
E.M.I.	10/-	32/3	+9d	15	15	4 13 0	33/3	23/9
Electrical Components	5/-	7/6		25	25	8 6 9*	7/6	6/6
Elec. Construction	£1	26/3		8½	8½	6 9 6	26/3	21/9
Elliott Bros.	5/-	29/3	+1/9	17½	20	3 8 6	29/3	26/3
Enfield Cable Ord.	£1	15/3		Nil	Nil	Nil	21/6	13/-
English Electric	£1	60/-xr	+1/6	12½	14	4 13 3	60/-	47/6
English Electric 3¾% Pref.	£1	13/-		3¾	3¾	5 15 6	14/3	13/-
Ericsson Tel.	5/-	45/6	+1/-	20†	22†	2 8 3†	45/6	33/3
Ever Ready	5/-	35/-	+3/3	35	35	5 0 0	35/-	30/-
Falk Stadelmann	£1	39/-		17½	17½	8 19 6	38/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

ners with G.E.C. in nuclear power production, were much in line with market anticipations and consequently caused little change in the price of the £1 shares at a fraction over 30s. A final distribution makes, with the 7½ per cent interim, a total of 20 per cent for the year. With the declaration of the interim payment, shareholders had been advised not to infer a larger total, but the latter represents in effect an improvement of 3⅓ per cent on last year's dividend, allowing for intervening scrip issues. The amount appears to be covered nearly four times over by the surplus available after tax. Trading profit of the group at £1·4 million is close up to the previous figure. The yield on the shares now becomes 3⅓ per cent.

Electrical Investments

Company or Board	Nom. Value	Middle price 6th May	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1957 Highest	1957 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	58/9	+1/3	12½	14	4 15 3	58/9	48/9
G.E.C. 6½% Pref.	£1	22/-		6½	6½	5 18 3	23/6	22/-
General Cables	5/-	12/9		30	30	11 15 3	13/6	11/6
Greenwood & Batley	£1	46/3		17½	17½	7 11 3	46/3	45/3
Hackbridge Holdings	5/-	21/9		25	30	6 18 0	21/9	19/9
Hackbridge & Hewittic	5/-	15/-		30	23*	7 13 3	16/-	13/6
Head Wrightson	£1	132/6		17½	20	3 0 6	132/6	112/6
Heatrae	2/-	4/3	+3d	15	15	7 1 3	4/3	4/-
Henley's	10/-	15/9xd		11½	11½	7 6 0	17/-	15/3
Holophane	5/-	24/3	+1/-	30	30	6 3 9	26/3	17/-
Hoover	5/-	39/6	+2/-	50	50	6 6 6	39/6	24/9
I.C.I.	£1	46/6xd	+3/-	10	10	4 6 0	46/6	37/9
Intl. Combustion	5/-	30/-	+2/6	20	22½	3 15 0	30/-	20/-
Johnson & Phillips	£1	28/3	−1/9	15	15	10 12 3	34/6	28/3
Lancashire Dynamo	£1	43/9xd	+9d	11	11	5 0 6	45/-	36/9
Laurence, Scott	5/-	19/3	+1/-	15	15	—	19/3	13/9
Lister, R. A.	£1	31/3	+1/3	9·3	10	6 8 0	31/3	26/9
London Elec. Wire	£1	53/3	−6d	12½	12½	4 14 0	53/9	43/-
Lucas, J.	£1	36/3		7½	7½	4 2 9	36/3	30/6
Marconi Marine	£1	33/9		10	10	5 18 6	33/9	31/-
Marryat & Scott	2/-	10/-	+9d	30	30	6 0 0	10/-	8/-
Mather & Platt	£1	60/6	+1/6	15	15	4 19 3	60/6	51/3
Metal Industries	£1	25/6		9	Nil	—	26/3	20/3
Midland Elec. Mfg.	£1	48/9		12½	12½	5 2 6	48/9	45/-
Morphy-Richards	4/-	16/6		50	50	4 17 0*	16/6	11/9
Murex	£1	74/6		20	20	5 7 6	74/6	65/-
Newman Ind.	2/-	2/9xd		10	10	7 5 6	2/9	2/1
Oldham & Son	1/-	2/6		20	17½*	7 0 0	2/6	2/3
Parnall (Yate)	5/-	8/9	+6d	12	12	6 17 3	8/9	5/9
Parsons, C. A.	£1	70/-xd		10	10	—	71/3	50/6
Plessey	10/-	84/9	+6/3	27½	30	3 10 9	84/9	61/-
Pye "A" Deferred	5/-	18/3		12½	12½	3 8 6	18/3	15/9
Reyrolle	£1	105/-		16½	17½	3 6 9	110/-	90/-
Rheostatic	4/-	10/-		18½	12½*	5 0 0	10/-	8/9
Richardsons Westgarth	5/-	19/-		16⅝	16⅝	4 7 9	19/-	17/-
Scottish Cables	4/-	18/3		27½	27½	6 0 6	19/3	15/-
Simon-Carves	5/-	30/-		28⅜	20*	3 6 9	30/9	26/-
Smith (England), S.	4/-	15/-		17½	17½	4 13 3	15/-	13/-
Southern Areas	£1	18/9		10	7½	8 0 0	20/-	13/9
Strand Elec.	5/-	7/9		15	15	9 13 6	8/-	7/3
Sturtevant	5/-	24/6xd	−2/9	15†	15†	3 1 3†	27/-	24/3
Sun Elec.	£1	43/9		20	25	11 8 6	43/9	43/9
Switchgear & Cowans	5/-	15/-	+3d	25	25	8 6 9	15/6	13/6
Taylor Tunnicliff	5/-	13/3		15	15	5 13 3	13/9	11/9
T.C.C.	10/-	38/9		25	25	6 9 0	38/9	35/-
T.C. & M.	£1	29/9xd		8½	8½	5 14 3	31/-	24/6
Telephone Mfg.	5/-	8/-	+6d	10	10*	6 5 0	8/-	6/3
Telephone Rentals	5/-	12/6		12½	12½	5 0 0	12/6	10/3
Thompson (John)	5/-	33/3		25	25*	3 15 3	37/-	29/3
Thorn Elec.	5/-	26/3	+3/-	15	15	2 17 3	26/3	16/3
Thornycroft	£1	36/6	−1/-	15	12½	6 17 0	37/6	32/9
Tube Investments	£1	67/-	+1/3	22½	15*‡	4 9 6	67/-	58/3
Vactric	5/-	18/9		15	17½*	4 13 3	18/9	12/9
Veritys	5/-	9/-		12½	12½	6 19 0	9/3	8/3
Walsall Conduits	4/-	14/3		70	20*	5 12 3	14/3	11/-
Ward & Goldstone	5/-	47/-	−6d	30	35	3 14 6	48/9	36/9
Watford	2/-	6/6xd		25	25	7 13 9	6/6	6/3
Westinghouse	£1	41/3		18	9‡	4 7 3	41/3	36/-
West, Allen	5/-	16/9	+3d	15	15	4 9 6	16/9	12/3
Wolf Electric	5/-	10/6xc		20	20	4 15 3*	10/6	8/9

Brush Group

News of further active developments within the Hawker Siddeley Group have been of practical interest to Brush Group shareholders, who expect soon to receive the formal invitation to become members of that company through an exchange of shares. Reports that Hawkers are negotiating with John Brown & Co. on the subject of a new organisation in the field of atomic energy helped to lift the price of Hawker £1 shares to over 40s, and automatically raised Brush 5s shares to 8s (an improvement of about 6d), the proposed exchange being on a one-for-five basis. If confirmed, this new development will represent another large item in the Hawker Siddeley policy of broadening the range of the group's activities, of which the proposed absorption of Brush is a part. In the latter deal, the recent Brush acquisition of the share capital of Asea Electric is included.

Laurence, Scott Dividend

With trading profits about 10 per cent higher at just under the million mark, Laurence, Scott and Electromotors are adhering to their customarily conservative dividend policy in keeping the distribution for 1956 to 15 per cent, the same total as for the previous year, when 2½ per cent of the payment was declared as a bonus. At the same time, the company's intention is to maintain that rate on capital to be increased by a "rights" offer of new 5s "A" shares on the basis of one, at a price of 10s, for every four "A" or "B" shares held. After the announcements the price of the existing "A" shares was put up by 1s, to 19s 3d, which indicates a prospective yield of about 4½ per cent, after the value of the dividend and the rights has been deducted.

Market Notes

Bakelite 10s shares remained firm at about 24s 6d after the chairman's review of progress and prospects at the annual meeting. They stand at about their best price of the year, having lost very little time in recovering from the effects of the one per cent reduction in the dividend declared in March. The decline in profits reported by British Vacuum Cleaner for the year ended last September, and the reduction of the dividend from 15 to 10 per cent, caused the 5s shares to be marked down at first from 8s to 5s 9d, but they quickly recovered to 6s 6d after consideration had been given to the evidence of revival in the demand for domestic appliances since the date of the accounts. Confirmation of that trend came with the decision of Burco Dean to raise this year's interim dividend from 5 to 7½ per cent.

REPORTS and DIVIDENDS

C. A. Parsons & Co., Ltd.—The annual meeting will be held on 22nd May. In his statement which has been circulated with the report and accounts for 1956, Sir Claude Gibb (chairman and managing director) says that the long-term plans for expansion and continuous re-equipment to which reference has been made for years past, have again enabled them to make a record year. Despite frequent delays in the receipt of steel supplies the output of turbine plant during 1956 exceeded the million kilowatts for which the present equipment was planned. Referring to the Calder Hall nuclear power station, Sir Claude says that the four Parsons turbo-generators in the first section of the station have all carried full load, as have the gas circulators, transformers, ductwork and the many other components they have supplied.

At the Stella power stations of the C.E.A. they placed into regular commercial service the ninth 60,000 kW turbo-generator installed there within a period of two years. Almost the whole construction of the Stella stations was carried out by members of the Nuclear Power Plant Co. They also commissioned during the year the largest blast furnace turbo blower in the world. This was the fifth Parsons turbo blower to be installed in the Appleby-Frodingham Steel Works of the United Steel Co., Ltd., at Scunthorpe, and requires a turbine of over 20,000 h.p. to drive it. The design of the boiler plant, buildings and other equipment associated with the turbo blower equipment was carried out and construction supervised by the Parolle Electrical Plant Co., Ltd., which is jointly owned by Parsons and Reyrolle.

During the year several transformers operating at 275 kV were put into service. Orders received during the year were an all-time record and included four turbo-generators each of 200,000 kW for the Hydro-Electric Power Commission of Ontario. These units, when installed in the Richard L. Hearn generating station, Toronto, alongside four 100,000 kW Parsons sets already operating there, will give a total station output of 1,200,000 kW, making it the largest power station in the world with turbo-generators of one manufacturer. After referring to some other overseas orders, Sir Claude says that among home orders is a 200,000 kW set for the C.E.A. which is to operate at a steam pressure of 2,350 lb/sq in with a steam reheating cycle. Other home orders include further units each of 120,000 kW also for the C.E.A.

Referring to the Nuclear Power Plant Co., Ltd., with which the company is associated, Sir Claude says that in December last it received the contract from the C.E.A. for the Bradwell nuclear power station which has a guaranteed minimum net electrical output of 300,000 kW.

Structural steel shortages caused delay during the year in the completion of the new machine shops at Heaton South West, but these shops are now practically complete and partly in operation. They have the largest underfloor off-peak electrical thermal storage heating system in the world. Electrical heating cables of "Pyrotenax" are placed on top of the main concrete floors and are then covered by a thin concrete screed and non-slip tiles. In cold weather the power consumed for heating "off-peak" will approach 4,000 kW.

Speaking of the Monopolies and Restrictive Practices Commission, Sir Claude says that the continuance of high taxation at its present lethal levels, if coupled with Government action based on the unrealistic conclusions of the Commission, at the same time as Britain enters into the European Free Trade Area, will assuredly wreck a strong and prosperous industry.

Sir Claude refers to the progress of the subsidiary companies and to Parsons' interest in the Anglo Great Lakes Corporation, Ltd., for the production of graphite for the British nuclear power programme.

The Brush Group, Ltd.—The annual meeting will be held on 30th May. In his statement circulated to stockholders, Mr. G. C. R. Eley (chairman) refers to the offer made by the Hawker Siddeley Group, Ltd., to acquire the whole of the issued capital of the Brush Group, and says that the Brush Group has been hampered for many years by a lack of permanent capital. The proposed merger with Hawker Siddeley should enable both groups to participate in the tremendous possibilities of the nuclear era. The advantages to be obtained from the fusion are, however, not restricted to nuclear activities. The formal offer will be made to Brush Group holders as soon as possible and the Brush directors strongly recommend acceptance. Dealing with the proposal to acquire the entire share capital of Asea Electric, Ltd., Mr. Eley says that the name of that company is to be changed to Fuller Electric Co., Ltd. Arrangements have been made for the continued manufacture, under licence, of products made to the design of ASEA, Sweden, and Fuller will remain the United Kingdom representative for the sale of products manufactured by the Swedish organisation. Subject to the necessary consents, the purchase of Asea Electric will take place irrespective of the proposed merger with the Hawker Siddeley Group.

Dealing with the trading results for 1956, the chairman says that notwithstanding the difficult conditions the Group slightly increased its turnover and received more orders than in 1955. The order book at the end of 1956 was dispersed among many customers in many countries. In spite of the Suez crisis there has not been—apart from the loss of the Egyptian market—any falling off in orders from the rest of the Middle East. In the important dollar market of Eastern Canada they achieved greater success than ever before in the sale of diesel engine generating sets. The chairman reviews the widespread manufacturing activities of the Group.

Aberdare Cables (Holdings), Ltd.—The annual meeting was held on 2nd May, Sir John Pascoe (chairman) presiding. In his circulated statement, the chairman said that the turnover of Aberdare Cables, Ltd., had been well maintained and at the end of the year the orders on hand were larger than those at the end of the previous year. There was an increase in orders from industrial users and in particular from the oil industry. In the latter industry they had obtained promising results by their development of extruded plastic protective sheathing on armoured power cables, for installation in ground contaminated with oil or salt water. As regards exports, their efforts in this direction had been continuing with satisfactory results.

Orders delivered and on hand by Aberdare Engineering, Ltd., had been well maintained and the turnover and orders received by South Wales Switchgear, Ltd., had exceeded those of previous years, a pleasing feature being the expansion of their overseas business. Contracts included one from the United States for 33,000 V switchgear, part of which was already in commission in Wyoming. They had also completed their first contracts for their new range of packaged station switchgear for Brazil, where they had now supplied ten substations. Satisfactory orders had been received from the C.E.A. and the N.C.B. Sir John referred to the progress of the companies in Canada and South Africa.

T. Clarke & Co., Ltd.—The profit for 1956, after deducting £43,252 for taxation, is £36,899, as compared with £34,005 for 1955. It is proposed to pay a final dividend of 8 per cent, making 16 per cent for the year. For the previous year the total dividend was 18 per cent, when the interim dividend was paid on smaller capital.

Simon-Carves, Ltd.—The group profit for 1956, before taxation, is £1,374,024, as compared with £1,385,041 for 1955. After deducting £708,275 for taxation, and adding £21,494, over-taxation provided in previous years, there is a balance of £687,243 (against £771,110), and the profit attributable to members of Simon-Carves, Ltd., is £686,416 (£749,134). It is proposed to pay a final dividend of 12½ per cent, making

20 per cent for the year on capital of £1,500,000. For 1955 the interim dividend was 11¼ per cent on £525,000 capital, and the final distribution was 17½ per cent on £1,000,000 capital. Revenue reserve receives £185,000 and the balance carried forward is £328,916 (against £245,106 brought in).

The British Vacuum Cleaner & Engineering Co., Ltd., reports that the group profit before taxation (after taking credit for £65,000 being a proportion of exceptional expenses carried forward as development expenditure) is £23,834, as compared with £218,178 for the preceding year, and after deducting £19,050 for taxation the group profit is £1,247 (against £121,212), of which £935 is attributable to the holding company. It is proposed to pay an ordinary dividend of 10 per cent for the year (against 15 per cent).

The Anglo-Portuguese Telephone Co., Ltd.—The gross revenue for 1956 amounted to £2,564,829, as compared with £2,288,656 for the previous year, and the net profit, after charging capital issue expenses of £42,569, is £379,003 (against £498,155). It is stated that the increased tax provision more than accounts for the reduction in the net profit. General reserve receives £150,000, and it is proposed to pay a final ordinary dividend of 5 per cent, maintaining the distribution for the year at 8 per cent. The "A" ordinary dividend for the year is also unchanged at 8 per cent. The interim ordinary dividend for 1955 was paid on smaller capital.

The Power Securities Corporation, Ltd., reports group profits for 1956, before providing for taxation and contract contingencies, of £761,612, as compared with £737,633 for 1955. Taxation absorbs £438,932, and £100,000 is allocated for contract contingencies, leaving a balance of £222,680 (against £310,996). It is proposed to pay a dividend of 11 per cent on £1·2 million for the full year. The additional £300,000 issued by way of rights ranks from 1st July last. The participating preference holders receive an additional 1½ per cent (1 per cent), making 8½ per cent (8 per cent) for the year.

Lightfoot Refrigeration, Ltd.—After providing £24,467 for taxation, the consolidated net profit for 1956 is £18,986, as compared with £7,371 for the previous year. Reserve receives £10,500, and it is proposed to pay a final ordinary dividend of 3 per cent, making 6 per cent for the year. For the previous year a final dividend only of 2½ per cent was paid.

A. H. Hunt (Capacitors), Ltd.—The annual meeting was held on 1st May, Mr. S. H. Brewell (chairman) presiding. Mr. Brewell's circulated statement was abstracted in our issue of 19th April. Addressing the meeting, he said that an amicable joint decision had now been reached with the Canadian Marconi Co. to cease actual manufacture and revert to the policy of selling in Canada products manufactured by the parent company in the United Kingdom. It was too early to state what final write-off would be necessary to put this new policy into complete effect, but it was anticipated that the resultant loss in their company's accounts would be substantially less than the figure for 1956.

Laurence, Scott & Electromotors, Ltd., report a trading balance for 1956 of £993,581, as compared with £894,335 for the preceding year, and after providing £410,000 for taxation, the net balance is £392,256 (against £359,219). It is proposed to pay a dividend for the year on the "A" and "B" ordinary shares of 15 per cent. A similar distribution was paid for 1955, which included a bonus of 2½ per cent. The consent of the Capital Issues Committee has been obtained for a "rights" issue of one "A" ordinary 5s share at 10s a share for every four "A" or "B" ordinary shares held. The board states that it should be possible to maintain the dividend for 1957 at 15 per cent.

Wolf Electric Tools (Holdings), Ltd.—The annual meeting was held on 2nd May, Mr. H. Richards (chairman) presiding. In his circulated review of the year, Mr. Richards said that once again a record value of sales was achieved, with exports making their full contribution. In particular, the Canadian branch had its most successful year so far and their new Australian subsidiary returned a small profit on only a partial year's working. In the home market the principal growth had been associated with their sales of Wolf "Cub" equipment. With the heavy outlay in publicity incurred in selling to the domestic market it had been necessary for them to accept a smaller profit margin than was normal with their industrial sales.

Richard Crittall & Co., Ltd.—The annual meeting was held on 3rd May. In the course of his circulated statement, Mr. G. C. R. Eley (chairman) said that in conjunction with the electrical contracting subsidiary, Grierson, Ltd., they were favourably placed to take advantage of developments in electrical heating and expected to be in the forefront of the considerable expansion which seemed likely in this type of contracting in the years ahead.

Matthew Hall & Co., Ltd.—The group profit for 1956, after deducting taxation of £96,225, is £107,376, as compared with £141,710 for the previous year. The dividend for the year is unchanged at 30 per cent.

Eveready South Africa, Ltd., has announced an unchanged interim dividend of 10 per cent.

New Companies

D. A. Jones (Engineering), Ltd.—Registered 10th April. Capital £100. Precision, electrical, electronic and mechanical engineers, etc. Directors: D. A. Jones and Eufron A. Jones. Regd. office: Piccadilly House, Piccadilly Circus, S.W.1.

Redhouse Electrical Co., Ltd.—Registered 6th March. Capital £100. Directors: J. Graham and G. F. Reynolds. Regd. office: 51, High Street, Watford, Herts.

K.G.M. Electronics, Ltd.—Registered 26th March. Capital £100. Solicitors: Courts & Co., 15, Wimpole Street, W.1.

Britepoint, Ltd.—Registered 27th March. Capital £100. Electronic and automation engineers, etc. Regd. office: 156, Strand, W.C.2.

Liquidation

Caulfield Holland, Ltd., electrical engineers.—Winding up voluntarily. Liquidator, Mr. P. W. Beale, 1, Pavilion Buildings, Brighton, 1, appointed 16th April.

Bankruptcies

G. B. Solomon, carrying on business at 57, Fore Street, St. Columb, Cornwall, as St. Columb Radio, radio and electrical dealer.—Receiving order made 24th April on debtor's own petition.

L. C. Sampson and E. C. Tubb, carrying on business in co-partnership under the style of Electro Radio Stores at Fore Street, Gunnislake, Cornwall, electrical and television dealers.—Last day for receiving proofs for dividend, 20th May. Trustee, Mr. H. Evans, 39, St. James's Street, London, S.W.1.

A. E. R. Honey, 48, Bramerton Road, Beckenham, Kent, 117, Anerley Road, Penge, London, S.E.20, and formerly of 13, Longton Grove, Sydenham, S.E.26, carrying on business in partnership with another under the style of A. E. Honey, electrical contractors.—Trustee, Mr. A. F. Evans, 8, Eccleston Square, London, S.W.1, appointed 17th April.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 17th May:—

STARITE. No. 759,897. Class 7. Dynamo electric machines.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.

SAMASTRONIC. No. 753,246. Class 9. Scientific apparatus; electric and electronic apparatus for use in the supervision, checking and control of industrial operations and in the calculation and furnishing of data and statistical information; cash registers, calculating machines, computing machines and tabulating machines, etc.—Powers-Samas Accounting Machines, Ltd., Powers-Samas House, Holborn Bars, London, E.C.1.

MAGISTOR. No. 756,125. Class 9. Magnetic apparatus for use in the control of electric current.—Metropolitan-Vickers Electrical Co., Ltd., St. Paul's Corner, 1-3, St. Paul's Churchyard, London, E.C.4.

TRANSISTOCOM. No. B760,839. Class 9. Intercommunication telephone and loudspeaking apparatus and instruments.—Modern Telephones (Great Britain), Ltd., Telesound House, 101, Tottenham Court Road, London, W.1.

GRADECK. No. 761,312. Class 9. Sound recording and sound reproducing apparatus and instruments, magnetic tape for use as sound recording and reproducing media, and parts.—W. H. Sanders (Electronics), Ltd., Gunnels Wood Road, Stevenage, Herts.

MAGI-GRILL. No. B761,104. Class 11. Grilling apparatus.—Brattel Electric Co., Ltd., Arcade House, 27, Old Bond Street, London, W.1.

No. 761,594 (design). Class 11. Installations for lighting, electric lamps and electric lighting fittings, and parts. No. 761,595. Class 17. Electric insulators and materials for electric insulation.—Busch-Jaeger Dürener Metallwerke Akt.-Ges. Ludenscheid, Westphalia, Germany. Address for service, c/o D. Young & Co., 10, Staple Inn, London, W.C.1.

NEW PATENTS — Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 0d each including postage) will be obtainable after 15th May from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1952

19828. Soc. Technique pour l'Industrie Nouvelle Soc. Anon., Stin.—Electrical impulse-controlled two-position switches. 6th August, 1952. (774892.)

27433. General Electric Co.—Apparatus for washing dishes and the like. 31st October, 1952. (774893.)

28121. British Thomson Houston Co., Ltd.—Illumination of instrument dials. 6th November, 1953. (774576.)

28630. Stahl, A., Stahl, O., and Stahl, O. (trading as Stahl Maschinenfabrik, R.).—Electric winches. 13th November, 1952. (774787.)

1953

20062. Soc. d'Electronique et d'Automatisme.—Electric pulse registering devices. 20th July, 1953. (775004.)

34581. British Thomson-Houston Co., Ltd.—Conduit structures. 26th April, 1954. (774777.)

1954

76. General Electric Co., Ltd.—Magnetic amplifier arrangements. 3rd January, 1955. (774685.)

3780. Pye, Ltd.—Television receivers. 1st February, 1955. (774578.)

6094. General Electric Co., Ltd., and Parton, K. C.—Electric motor control arrangements. 24th February, 1955. (774691.)

9797. Metropolitan-Vickers Electrical Co., Ltd.—Saturable core reactance devices. 25th March, 1955. (774589.)

12827. General Electric Co., Ltd., and Plummer, A. R. F.—Manufacture of semiconductor devices. 3rd August, 1955. (774800.)

13899. General Electric Co., Ltd., Cornell, W., and Shepherd, S. A.—Structures for mounting electrical components. 4th May, 1955. (774978.) 13900. Methods of forming electrical terminals on a terminal board or strip. 4th May, 1955. (774979.)

14853. British Insulated Callender's Cables, Ltd.—Joint for electric conductors. 18th May, 1955. (774593.)

17687. Philips Electrical Industries, Ltd.—Measuring or recording devices. 16th June, 1954. (774803.)

19776. Fuller, L., and Sudlow, E. W.—Electric secondary batteries. 16th June, 1955. (775025.)

20020. Taylor, E. H.—Snap-action electric switches. 8th July, 1955. (774911.)

22533. Electric Construction Co., Ltd.—Electrical contactors. 15th July, 1955. (774705.)

22592. Hellermann, Ltd.—Multi-way seal for electric cables. 6th October, 1955. (775029.)

24850. Goldstaub, H. H.—Thermionic valve retainers. 22nd August, 1955. (774707.)

30131. Dorman & Smith, Ltd.—Electrical switchgear. 19th October, 1955. (774917.)

30716. British Insulated Callender's Cables, Ltd.—Manufacture of metal tubing for use in the manufacture of electric cables. 24th October, 1955. (Addition to 703003.) (774600.)

34187. Igranic Electric Co., Ltd.—Electric motor controllers. 25th November, 1954. (774603.)

35418. Philips Electrical Industries, Ltd.—Methods of degassing electrodes of electric-discharge tubes. 7th December, 1954. (774926.)

1955

55. Compagnie Auxiliaire des Mines.—Batteries of accumulators and bench for charging this battery. 3rd January, 1955. (774605.)

2522. General Electric Co.—Insulation of dynamo-electric machines. 27th January, 1955. (774821.)

3083. Soc. Anon. Novi.—Reciprocating electric motor pumps. 2nd February, 1955. (774931.)

3190. Newbery, Ltd., S.—Motorised switchgear. 3rd February, 1956. (775045.)

4629. Goldberg, J., and Cox, B.—Electrical apparatus for sorting data. 16th February, 1955. (774936.)

8492. General Electric Co.—Speed regulating systems for d.c. motors. 23rd March, 1955. (774741.)

9338. Decca Record Co., Ltd.—Electric control circuits. 10th November, 1955. (774830.)

9450. General Electric Co.—Electric heating units. 31st March, 1955. (774831.)

9565. Philips Electrical Industries, Ltd.—Electric lampholders. 1st April, 1955. (774610.)

10234. Compagnie Industrielle des Telephones.—Electromagnetic relays. 7th April, 1955. (774832.)

11089. Franck, A.—Rotary electric machines and particularly electric motors. 18th April, 1955. (774616.)

11702. Voigt & Haeffner Akt.-Ges.—Tubular electric heaters. 22nd April, 1955. (774836.)

13210. National Lead Co.—Storage battery active material. 6th May, 1955. (774746.)

13848. Allmanna Svenska Elektriska Aktiebolaget.—Method of, and apparatus for, electrically butt welding studs and the like. 13th May, 1955. (774945.)

16752. Philips Electrical Industries, Ltd.—Small rotary electrical machines. 10th June, 1955. (774631.)

18499. Philips Electrical Industries, Ltd.—Electric lighting fittings. 27th June, 1955. (774753.)

19868. General Electric Co.—Electric current transformers. 8th July, 1955. (774638.)

19886. Soc. Anon. Française du Ferodo.—Electric control circuits for electromagnetic clutches. 8th July, 1955. (774845.)

22012. Philips Electrical Industries, Ltd.—Frequency division circuit arrangements. 29th July, 1955. (774959.)

23166. Westinghouse Electric International Co.—Clothes drying apparatus. 11th August, 1955. (774851.)

23328. Shell Research, Ltd.—Liquid electrical insulating compositions. 12th August, 1955. (774646.)

23678. Erie Resistor Corporation.—Capacitor. 17th August, 1955. (774647.)

25286. Standard Telephones & Cables, Ltd. (International Telephone & Telegraph Corporation).—Continuous wave beacon system. 2nd September, 1955. (774962.)

25798. Telefonaktiebolaget L. M. Ericsson.—Electromagnetic relays. 8th September, 1955. (774656.)

25861. Philips Electrical Industries, Ltd.—Thermionic valve amplifiers. 9th September, 1955. (774760.)

30562. Ericsson Telephones, Ltd.—Sealing glands for electric cables. 26th October, 1955. (774662.)

34084. Siemens-Schuckertwerke Akt.-Ges.—Convertor sets for electric vehicles. 28th November, 1955. (774666.)

35136. General Electric Co.—Silicone rubber of improved thermal stability. 7th December, 1955. (774869.)

35545. Armstrong Whitworth Aircraft, Ltd., Sir W. G.—Electrical junction boxes. 10th December, 1955. (775070.)

1956

25807. British Thomson-Houston Co., Ltd.—Illumination of instrument dials. 6th November, 1953. (774577.)

28794. Pye, Ltd.—Television receivers. 1st February, 1955. (Divided out of 774578.) (774579.)

CATALOGUES AND LISTS

AIR FILTERS.—12-page manual describing and illustrating "Trion" electronic air filters.—**Harris Engineering Co., Ltd.,** York Works, Browning Street, London, S.E.17.

CABLE BINDING SYSTEM.—Catalogue giving particulars of the Hellermann binding system including details of the full range of sleeves in rubber, synthetic rubber and plastic materials.—**Hellermann, Ltd.,** Crawley, Sussex.

FOOD MIXERS.—Booklet giving instructions for the use of the "Hilma-Mix" food mixer, together with a number of useful recipes.—**Hillman Electric Motors, Ltd.,** 2-3, Northwold Buildings, Stoke Newington, London, N.16.

INSTRUMENTS. — Illustrated leaflet (112) dealing with a portable thermo-couple potentiometer, together with price lists M and E.—**Doran Instrument Co., Ltd.,** Stroud, Glos.

LIGHTING FITTINGS.—36-page illustrated catalogue (166), together with separate price list (165), covering a range of contemporary decorative lighting fittings.—**C. M. Churchouse, Ltd.,** Clarendon Works, Clarendon Cross, London, W.11.

Technical bulletin (No. 24) on considerations in relation to flameproofing and weatherproofing of lighting fittings in hazardous locations.—**Victor Products (Wallsend), Ltd.,** G.P.O. Box No. 10, Wallsend-on-Tyne.

SPACE HEATING.—Catalogue (C.46) dealing with electric air heater batteries and leaflets on a car engine heater for permanent installation in cooling systems of motor vehicles.—**Geo. Bray & Co., Ltd.,** Leicester Place, Leeds, 2.

Leaflet giving particulars of the Thermodare off-peak night storage heaters of new contemporary design, together with a pamphlet describing a shelf fitting for providing protection for the heater and additional shelf space.—**Thermodare (Great Britain),** 94-98, Petty France, London, S.W.1.

TELEPHONE EQUIPMENT.—Bulletin (2320) dealing with the company's type 211 private automatic branch exchange extensible from 100 lines upwards.—**Automatic Telephone & Electric Co., Ltd.,** Strowger House, Arundel Street, London, W.C.2.

Leaflet on the "Intertalk" 3-point loudspeaking communication systems.—**Easco Electrical (Holdings), Ltd.,** Brighton Terrace, London, S.W.9.

TERMINALS.—Catalogue giving details of a range of terminal lugs and panels, spring terminals and moulded insulators designed for the electrical, electronic, radio and instrument industries.—**Harwin Engineers, Ltd.,** Nibthwaite Road, Harrow, Middlesex.

Leaflet giving particulars of the "Kabi" 12-way 5/10 A flexible terminal strip.—**Precision Components (Barnet), Ltd.,** 13, Byng Road, Barnet, Herts.

WELDING EQUIPMENT. — Folder (WA/135) giving details of "Stainees" electrodes for the welding of austenitic stainless steels.—**English Electric Co., Ltd.,** Stafford.

16-page technical brochure (G.13023) dealing with the electronic control of resistance welding.—**British Thomson-Houston Co., Ltd.,** Rugby.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Copper Refineries Pty., Ltd., Townsville, Queensland. 20th May. 250 kW mercury arc rectifiers. (E.S.B. 10968/57. Ten/25616.)*

Bangor (Co. Down).—Education Committee. 16th May. Electrical installation at Bangor Intermediate School extension. W. J. Ogle, consulting engineer, 63, Main Street.

Birkenhead.—Works and Building Department. 28th May. Tower wagon. (See this issue.)

Esher.—U.D.C. 28th May. Street lighting in Hampton Court Way, Thames Ditton. (See this issue.)

Greece.—Ministry of National Defence, Athens. 17th May. Radio beacons. (E.S.B. 10293/57. Ten/25530.)*

Hartlepool.—Corporation. Street lighting in Winterbottom Avenue, Hartlepool. Borough engineer, Borough Buildings, Hartlepool.

India.—Damodar Valley Corporation. 13th June. 132 kV and 33 kV disconnecting switches. (E.S.B. 10653/57. Ten/25551.)*

Iraq.—Directorate General of Municipalities, Baghdad. 25th May. D.c. switchboard. (E.S.B. 11073/57. Ten/25617.)*

Kuwait.—Government Electricity Department. 20th May. Capacitor condensers. (E.S.B. 10989/57. Ten/25598.)*

Morley.—Corporation. Street lighting equipment. (See this issue.)

New Zealand.—G.P.O., Wellington. 20th May. Twin cables. (E.S.B. 10476/57. Ten/25529.)* 22nd May. Carbon filament switchboard lamps. (E.S.B. 9782/57. Ten/25578.)* 23rd May. Cords and cordage. (E.S.B. 9783/57. Ten/25562.)* 28th May. Electronic valves. (E.S.B. 10565/57. Ten/25587.)* 4th June. Mercury vapour discharge lamps. (E.S.B. 10564/57. Ten/25563.)*

State Hydro-Electric Department, Wellington. 9th July. Sixteen 110 kV, 1,000 or 1,500 MVA circuit-breakers. (E.S.B. 11050/57. Ten/25622.)* 16th July. Eighteen 110 kV, 2,500 or 3,500 MVA circuit-breakers. (E.S.B. 11187/57. Ten/25624.)*

Northern Ireland.—Electricity Board for Northern Ireland. 14th June. Two 6,000 kVA transformers. (See this issue.)

Pakistan.—Posts and Telegraphs, Karachi. 15th May. Air conditioning machinery. (E.S.B. 10887/57. Ten/25544.)*

Department of Supply and Development, Chittagong. 21st May. 223 125 W fluorescent lighting fittings and 35 250 W fittings. (E.S.B. 10489/57. Ten/25674.)*

Persia.—Posts, Telegraphs and Telephones, Teheran. 18th May. Glass insulators. (E.S.B. 10460/57. Ten/25629.)*

South Africa.—Union Tender and Supplies Board. 16th May. Light wire clamps. (E.S.B. 10457/57. Ten/25535.)* 23rd May. Cadmium copper line wire. (E.S.B. 10767/57. Ten/25548.)* Cable markers. (E.S.B. 10862/57. Ten/25580.)* 24th May. Steel poles. (E.S.B. 10899/57. Ten/25524.)* 6th June. Twenty lighting sets.

South African Railways, Johannesburg. 22nd May. Six battery chargers. (E.S.B. 10497/57. Ten/25527.)* Heat resistant cable. (E.S.B. 10496/57. Ten/25537.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Durban Corporation. 24th May. Transformers, ranging from 15 to 50 kVA. (E.S.B. 10534/57. Ten/25560.)*

Willesden.—Borough Council. Electrical accessories, cables and conduits for the year to 31st March, 1958. (See this issue.)

ORDERS PLACED

London.—L.C.C. Fifty electric passenger lifts for various estates (£110,741).—Bennie Lifts. Improvements including rewiring of the electrical installation at Brixton Women's Institute (£11,160). — E. Satterthwaite. Renewal and improvement of electrical installation at Shoreditch Training College, Egham (£5,901).—J. A. Brown & Partners. Renewal and improvement of electrical installation at Clapham County Secondary School, Battersea (£5,159).—Thorpe & Thorpe.

Wandsworth Borough Council. Recommended. Lighting scheme, Clapham. Columns (£3,832).—Concrete Utilities. Lanterns and control gear (£4,228).—Engineering & Lighting Equipment Co. Erection and installation (£2,475).—Harland & Wolff.

Londonderry.—City Council. Electrical installation at new swimming bath (£2,065).—McDowell, Duncan & Linnegan.

Northumberland.—County Council. Automatic telephone system at the County Hall, Newcastle-on-Tyne (£4,634). — Standard Telephones & Cables.

Peterlee (Co. Durham).—Development Corporation. Electrical installations in 110 houses at Acre Rigg, Peterlee.—J. Calvert (Electrical).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Acton.—Factory; Harold Wesley, Ltd., manufacturing stationers, Acton Lane, London, N.W.10.

Airdrie.—Flats and maisonnettes (322), Holehills; burgh surveyor.

Andover.—Roman Catholic Church, Croye Close; C. Grace & Sons, Ltd., builders, Clatford Road.

Arnold. — Technical grammar school, Arnold Hill Farm (£247,755); county architect, County Hall, Trent Bridge, Nottingham.

Ballyclare (Co. Antrim).—Intermediate school and an extension to the primary school; U.D.C. surveyor.

Bedford.—Science block, Bedford Modern School (£58,277); C. W. White, Ltd., Bedford.

Belfast.—Five-storey blocks of flats and maisonnettes and four-storey blocks of flats and shops at Annadale Embankment; city surveyor.

Berkhamsted.—Dwellings (216), Westfield estate; U.D.C. surveyor.

Bexley.—Flats and maisonnettes (70), East Wickham, and 61 dwellings at Hurst Place site; borough engineer, Council Offices, Bexleyheath, Kent.

Billingham-on-Tees.—Offices for U.D.C. (£200,000); E. Shaw, surveyor.

Blackpool.—Reinstatement (after fire), of Tower ballroom and lounge; Blackpool Tower Co., Ltd., Empress Buildings, Church Street.

Factory extension; Symbol Biscuits, Ltd., Devonshire Road.

Bournemouth.—Rebuilding Victoria House (£60,000); Shaftesbury Society, 32, John Street, London, W.C.1.

Bracknell. — Factory, Western Road (£80,000), for Development Corporation; Boyd & Murley, Ltd., builders, 87, London Street, Reading.

Bradfield.—Houses (148), Three Firs site, Burghfield; H. A. Champ, clerk to R.D.C., 26, Bath Road, Reading.

Bristol.—Extensions at Stoke Bishop for University; A. N. Coles, Ltd., contractors, Sutton Road, Plymouth.

Cambridge.—New hospital to be erected on site between Hills Road and Long Road (£800,000); Architects' Department, United Cambridge Hospitals Board, 33, Parkside, Cambridge.

Cardiff.—Extensions to College of Technology and Commerce, Cathays Park (£511,000); Sir Percy Thomas & Son, architects, 10, Cathedral Road, Cardiff.

Carlisle.—Special school for educationally subnormal children (£40,000); H. Cartner & Son, builders, Knowe Terrace, Carlisle.

Carrickfergus (Co. Antrim).—X-ray, outpatients, physiotherapy and casualty departments at Carrickfergus Hospital; East Antrim Hospital Management Committee.

Cheltenham.—Three-storey departmental stores, etc., Royal Hotel site, High Street; E. Woodbourne, company architect, F. W. Woolworth & Co., Ltd., 1, New Bond Street, London, W.1.

Clapham (Beds).—Private housing estate with 98 houses and bungalows; Arthur E. Craig & Co., builders, 39, High Street, Bedford.

Coseley.—Flats (72), Wallbrook and Old End site, and houses and flats (26), Turton Road site extension, Princes End; Joseph C. Roper, clerk, Council House, Coseley, Staffs.

Cradley Heath.—Office block, Woods Lane; J. Harper & Sons, Ltd., builders, Blackheath, Birmingham.

Crewe.—Hostel block at Training College; county architect, County Hall, Chester.

Cumberland. — Secondary schools at Aspatria, Distington, Egremont and Penrith; county architect, Portland Square, Carlisle.

Secondary school at Dalston (£150,000); R. E. Reay and Son, contractors, Penrith.

Cwmbran.—Houses, flats and maisonnettes (233), new town centre development; T. W. Rees, general manager, Victoria Street, Cwmbran, Mon.

Dartford.—Senior girls' school; Howard V. Lobb & Partners, architects, 20, Gower Street, London, W.C.1.

Dewsbury. — Showrooms and offices, Willans Rise; John Fewster, Ltd., Eightlands Road.

Doncaster.—Divisional headquarters, Glasgow Paddocks; North Eastern Division, National Coal Board, The Lodge, South Parade, Doncaster.

Primary school, Clay Lane; T. H. Johnson & Son, architects, 20, Priory Place.

Dowlais.—Foundry for Guest, Keen Iron & Steel Co., Ltd.; W. S. Atkins & Partners, consultants, 6, Park Place, Cardiff.

Edinburgh.—Houses (176), Gracemount development (£200,000); city engineer, 329, High Street.

Eston.—Houses (241), second section of Teesville East estate; C. Harrison, U.D.C. surveyor, 246, Normanby Road, South Bank, Yorks.

Evesham.—Hotel, Battleton Road; T. R. Bateman, architect, 21, Vine Street.

Finchley.—Shops and offices, High Road; Morris Land & Property Co., Ltd., 76, Stafford Court, London, W.8.

Gateshead.—Improvements at Bensham Hospital (£30,000); chief architect, Newcastle

[*Continued on next page*

Hospital Board, Benfield Road, Newcastle-on-Tyne.

Grimsby.—Factory, Humber Bank site; Courtaulds, Ltd., textile manufacturers, St. Martins-le-Grand, London, E.C.1.

Hatfield.—Church of St. John; Brett, Boyd & Bosanquet, architects, 16, Brendon Street, London, W.1.

Huntingdon.—Home for old people; county architect, Huntingdon.

Kingston-on-Thames.—Offices and staff houses, Vicarage Road; Metropolitan Water Board, New River Head, Rosebery Avenue, London, W.C.1.

Office block and laboratories; Hawker Aircraft, Ltd., Richmond Road.

Leamington Spa.—Seven-storey flats, Brook Street; R. Harley-Smith, architect, Gordon House, Carrington Street, Nottingham.

Leicester.—Training college, Scraptoft Hall, including hostel blocks (£361,135); city architect.

Leigh.—R.C. secondary school for girls (£155,513); Lancashire county architect, County Offices, Fishergate Hill, Preston.

London. — Extensions to Polytechnic, Manresa Road, Chelsea; John Greenwood, Ltd., builders, 12, Arthur Street, E.C.4.

Office block, Southwark Bridge Road and Park Street; Sir Robert McAlpine & Sons, builders, 80, Park Lane, W.1.

Factory, Prescot Street, Stepney; Orange Crush Co. (London), Ltd., Ibex House, Minories, E.C.3.

College buildings, Torrington Place; University College of London, Gower Street, W.C.1.

Macclesfield. — Houses (450), Weston estate; borough architect, 3, Jordangate.

Manchester.—Works, Mosley Road, Stretford; British Oxygen Gases, Ltd., Bridgewater House, Cleveland Row, London, S.W.1.

Middlesbrough.—New kitchens at Middlesbrough General Hospital (£30,000); chief architect, Newcastle Hospital Board, Benfield Road, Newcastle-on-Tyne.

Newcastle-on-Tyne. — Factory additions, Vicars Lane, for Lucozade, Ltd.; John Jackson & Sons, builders, Corporation Street, Newcastle.

Newport (Mon). — Houses (660) for employees; Atlantic Shipbuilding Co., Ltd., The Docks.

North Riding.—Modern school at Eston (£115,000); J. W. Henderson & Co., contractors, Church Row, Stockton.

North Shields.—Factory, near Wallsend Road, for Stella Building Products, Ltd.; Coseley Engineering Co., contractors, Wolverhampton.

Oldbury. — Secondary technical school (£115,000); R. Y. Logan, director of education, Castle Street, Worcester.

Plymouth.—Secondary technical school, Widey Lane; city architect.

Offices, stores and garage, Cremyll Street, Stonehouse; Davies & Cann, Ltd., Freeman's Wharf.

Portsmouth. — Factory, Paulsgrove (£140,000), for Johnson & Johnson (Great Britain), Ltd.; Howe & Bishop, Ltd., builders, Crown Buildings, Clarendon Street, Portsmouth.

Factory, Southampton Road; Drayton Engineering Co., Ltd., 264, Havant Road, Drayton, Cosham.

Reading.—Kitchen (500 meals), Reading School; G. F. Darlow, town clerk, Town Hall.

Redcar.—Houses (224), adjoining Redcar Lane; K. W. Ash, borough engineer.

Salford.—Cromwell Secondary Modern School; Cruickshank & Seward, architects, 196, Deansgate, Manchester.

Saltburn.—Houses (100) and bungalows (10) at Marske; U.D.C. surveyor, Council Offices.

Scarborough.—R.C. church at Eastfield; A. W. Sinclair & Son, builders, Commercial Street.

Scunthorpe.—Junior school, Riddings estate (£55,000); county architect, Lincoln.

Southam.—Dwellings (102), Long Itchington; clerk to R.D.C., Arundel House, Coventry Road, Southam, near Rugby.

Southampton.—Old people's homes (33), shops and flats, Weston Farm estate, and old people's homes (102), Thornhill; borough engineer, Civic Centre.

Stickney (Lincs). — Secondary modern school for Lindsey C.C. (£92,944); J. Colam & Son, Ltd., 10, Horncastle Road, Boston.

Stockton.—New works and extensions (£1,200,000); Power Gas Corporation & Ashmore, Benson Pease & Co., Ltd.

Sunderland.—Private housing estate (165 houses); Wimpey & Co., Ltd., builders and contractors, Orchard House, Fenwick Terrace, Newcastle-on-Tyne.

Garage (32 vehicles) in Tavistock Place, for A. Hector Grabham, Ltd.; Newrick & Blackbell, architects, 58, John Street.

Tunbridge Wells.—Factory, North Farm estate; Harris Engineering Co., Ltd., York Works, Browning Street, London, S.E.17.

Uxbridge.—Secondary grammar school, Western Avenue, Ickenham (£252,880); Middlesex county architect, 1, Queen Anne's Gate Buildings, London, S.W.1.

Walsall.—Flats (100), Blakenhall and Green Lane; M. E. Habershon, borough engineer, Town Hall.

West Bromwich.—Houses (209), Witton Lane estate; H. Schofield, borough surveyor, Town Hall.

Whitehaven.—First stage of buildings for new Hensingham Hospital; C. B. Pearson & Son, architects, 18, Dalton Square, Lancaster.

Whitley Bay.—Extensions to bus station for United Automobile Services, Ltd.; A. A. Briggs, architect, 10, Fleet Street, London, E.C.4.

Wigan.—Cardinal Newman R.C. Secondary School, Hindley; Reynolds & Scott, architects, 9, Albert Square, Manchester.

Willesden.—Extensions to factory, Neasden Lane; G. & E. Bradley, Ltd., Beresford Mount Pleasant, Alperton, Wembley.

Two-storey factory extensions; Imperial Machine Co., Victoria Works, Edgware Road, N.W.2.

Wolverhampton.—Four new operating theatres at the Royal Hospital (£220,000); Birmingham Regional Hospital Board, 10, Augustus Road, Edgbaston, Birmingham.

Wrexham.—Works reconstruction; Brymbo Steelworks, Ltd., Brymbo, near Wrexham.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates do not clash with others already arranged.

Tuesday, 14th May

BELFAST. — Engineering Department, Queen's University, 6.30 p.m. I.E.E. Northern Ireland Centre. Annual general meeting.

BOURNEMOUTH. — Grand Hotel, Firvale Road, 7.15 p.m. A.S.E.E. Bournemouth Branch. Annual general meeting.

LIVERPOOL.—24, Hatton Garden, 6 p.m. I.E.S. Liverpool Centre. Annual general meeting.

LONDON.—At the Royal Society of Arts, John Adam Street, W.C.2. Illuminating Engineering Society. Annual meeting (5.30 p.m.) followed by "Changing Tastes in Design," by P. Reilly (6.30 p.m.).

MANCHESTER. — College of Technology, 7.30 p.m. Society of Instrument Technology, Manchester Section. Annual general meeting followed by "Industrial Applications of Radio Isotopes," by H. A. Tapsfield.

Wednesday, 15th May

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio and Telecommunication Section. "A Survey of Transistor Circuit Techniques."

Connaught Rooms, W.C.2, 12.30 for 1. Electrical Industries Club. Monthly luncheon. Speaker, P. H. Galsworthy.

I.E.E. London Graduate and Student Section. Visit to Belling & Co., Enfield (2.30 p.m.).

ROCHESTER. — King's Head Hotel, High Street, 7 p.m. Incorporated Plant Engineers, Kent Branch. "Safety and The Factories Act," by V. B. Jones.

WOLVERHAMPTON. — Wolverhampton and Staffs. Technical College, Wulfruna Street, 7.30 p.m. Institution of Production Engineers, Wolverhampton Graduate Section. "Gas Turbines—Basic Principles and Production Difficulties," by C. E. Wurr.

Wednesday, 15th May, to Friday, 17th May

BUXTON. — Palace Hotel. Incorporated Plant Engineers. National Conference.

Thursday, 16th May

BRISTOL.—The University, 7 p.m. I.E.E. Bristol Graduate and Student Section. Annual general meeting, followed by a film show.

PLYMOUTH.—New George Street, 3 p.m. I.E.E. South-Western Sub-Centre. "Age and the Incidence of Fires in Electrical Installations," by L. Gosland.

Thursday, 16th May, and Friday, 17th May

LONDON.—At the Institution of Electrical Engineers, Savoy Place, W.C.2. Aluminium Development Association. Symposium on "Aluminium in Electrical Engineering."

Thursday, 16th May, to Sunday, 19th May

DUNBLANE HYDRO.—E.C.A. of Scotland. Annual conference.

Saturday, 18th May

LONDON.—I.E.E. Radio and Telecommunication Section. Repeat Section visit to B.B.C. and I.T.A. Television Transmitting Stations. (Members to meet at the Institution building at 9.15 a.m.)

NOTTINGHAM. — A.S.E.E. Nottingham Branch. Visit to Crossley Premier, Ltd.

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